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ABSTRACT

MATHCO is a motivating series of audiovisual and print materials designed to overcome the negative effects of sex bias and stereotyping on the attitudes, interests, and aspirations of girls toward mathematics and mathematics-related careers. The materials teach mathematics skills, demonstrate relationships between mathematics and other subjects, and provide exposure to mathematics-related careers. They are useful for boys as well as girls at the pre- and early-adolescent stage; they are both multiethnic and nonsexist in text and illustrations. Module 4 focuses on practical applications of mathematics, including making change, adjusting recipes, unit pricing, ordering from catalogs, building a doghouse, and calling long distance. Activities and activity worksheets are included, in addition to the audiovisual script. (MNS)

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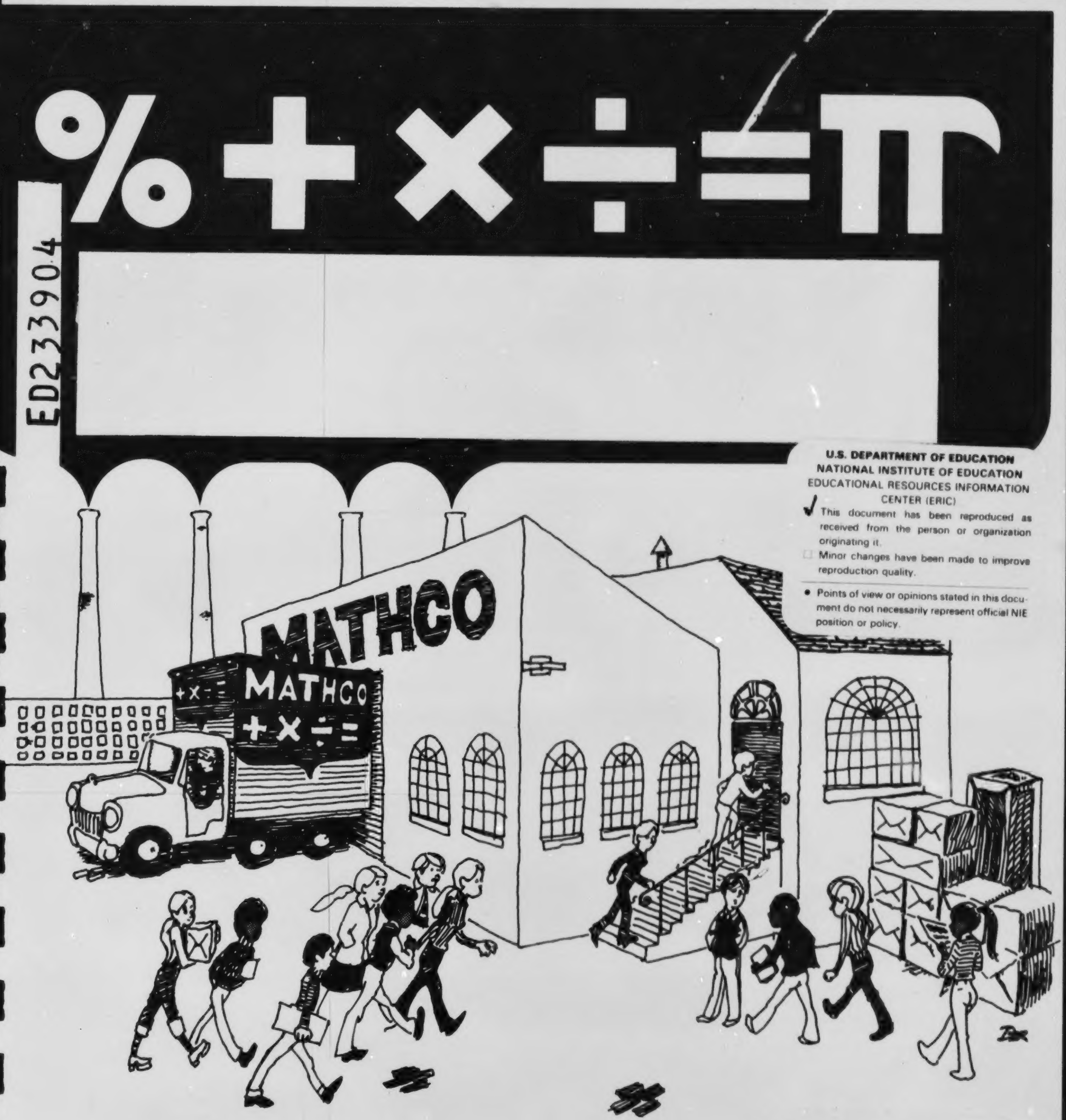

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MATHCO

University of Oklahoma
Southwest Center for Human Relations Studies
Norman, Oklahoma

Women's Educational Equity Act Program
U.S. Department of Education

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MATHCO TEACHER'S GUIDE

MODULE 4

Close Encounters with Everyday Math

(Math and Practical Arts/Life)

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U.S. DEPARTMENT OF EDUCATION
T. H. Bell, Secretary

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STATEMENT OF ENDORSEMENT

The National Review Board has carefully examined and heartily endorses MATHCO as a high-quality and motivating series of audiovisual and print materials designed to overcome the negative effects of sex bias and stereotyping on the attitudes, interests, and aspirations of girls toward mathematics and math-related careers.

These materials have been designed to teach math skills, demonstrate interrelationships between math and other subjects, and provide exposure to a wide variety of math-related careers. These informational and skill-building activities are valuable for boys as well as girls and are both multiethnic and nonsexist in text and illustrations.

We believe that the use of these materials with pre- and early-adolescent students can help to alleviate the math anxiety and avoidance that are characteristic of girls at these ages, resulting in their disproportionately small numbers in high-level mathematics courses and math-related careers.

Over the past two years, the Board has provided advice and assistance to the MATHCO staff as it has conceived, developed, and validated these materials. We are confident that our enthusiasm for this project will be shared by educators throughout the country.

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MODULE 4 OVERVIEW

To introduce students to Module 4, MATHCO presents "Close Encounters with Everyday Math," a 13-minute sound filmstrip. In this presentation, MATHCO "burds" (birdlike creatures) portray children and adults faced with problems that require a knowledge of mathematics for their solution. The presentation consists of a series of skits that give students a preview of the activities they will be doing in Module 4. The message to students is to be prepared for those "close encounters" with math that they face in their present and future lives as adults. The narrative concludes with the following idea for students to consider: Since you will be using math time and time again in your everyday life for as long as you live, think how much better it will be if you can use math successfully.

The main purpose of Module 4 activities is to illustrate some of those very practical ways in which math is used in everyday situations. These utilitarian, life-oriented activities are geared to enhance an understanding and appreciation of mathematics and to show students that math is indeed a subject well worth their time and effort. After students have viewed the Module 4 audiovisual, the teacher should select from among the Module 4 activities those that are deemed best suited to his or her group of students. Module 4 activities are as follows:

1. Making Change
2. Adjusting Recipes
3. Unit Pricing
4. Writing and Recording Checks
5. Ordering from a Catalog
6. Markups
7. Checking the Check
8. Time Cards
9. Rules of Bowling
10. Bowling
11. Pyramid Power
12. Building a Doghouse
13. Surface Area (Cost of Paint and Wallpaper for a Room)
14. Calling Long-distance
15. Auto Math

These activities may be done in any order that the teacher prefers, with one exception: Activity 9 should be covered before going on to the MATHCO bowling game presented in Activity 10. Some activities may be selected because they relate to the interests of the students. Others will be selected because they deal with math skills with which the students are currently working, review math skills the students should know, and/or present a true-to-life math application that will enhance students' appreciation for the study of mathematics.

MODULE 4 AUDIOVISUAL SCRIPT

CLOSE ENCOUNTERS WITH EVERYDAY MATH
(Math and Practical Arts/Life)

VISUAL	AUDIO
Begin audio with black frame following focus frame.	(Music)
Frame 1 - MATHCO cover sheet is shown with caption "MATHCO presents: Close Encounters with Everyday Math."	MATHCO presents: Close Encounters with Everyday Math.
Frame 2 - Adult burd* arrives home and asks baby-sitter, "What do I owe you for baby-sitting four hours at 85 cents per hour?" The baby-sitter (holding two baby burds and with two more clinging to him or her) looks puzzled. The baby-sitter obviously does not know how to figure out the math problem.	(Music)
Frame 3 - A burd in a supermarket is looking a display of "burd food." The burd foods have various prices given along with unit pricing information. The burd is thinking, "Which is the best buy?" He or she seems unable to decide.	(Music)

---

*The MATHCO "burd" differs substantially from the normal bird, which accounts for the difference in spelling.

VISUAL	AUDIO
Frame 4 - A burd is pictured in a backyard in the middle of piles of boards, nails, etc. He or she is thinking, "Where did I go wrong?" Beside him or her is a very large dog with a too-small doghouse resting on its back. It is apparent that the burd measured inaccurately.	(Music)
Frame 5 - Scene depicting burd children in a classroom.	At times you may wonder why you spend day after day, year after year, studying math in school.
Frame 6 - Two large burd feet are shown standing over a "math problem" worm.	The fact of the matter is that you study math in order to prepare yourself to stand on your own two feet as you encounter mathematical problems in your present and future life.
Frame 7 - Adult burd is holding a plate of worm cookies. She or he looks confused and desperate and is thinking, "I thought if I doubled the recipe, I'd have enough cookies to go around." The burd has three worm cookies, but there are four baby burds crying in the nest.	(Music)
Frame 8 - A burd cashier is sitting by stacks of bills and assorted coins, thinking, "Is this the correct change for a hundred-dollar bill?" He or she is obviously very confused.	(Music)

VISUAL	AUDIO
Frame 9 - A burd is painting a burd house and has run out of paint. He or she is thinking, "Oh, no! I got this paint on sale, and there's not enough!" The burd has obviously miscalculated.	(Music)
Frame 10 - The MATHCO narrator is pictured wearing a green suit, with a MATHCO badge on his lapel.	This MATHCO module offers problem-solving situations that young men and women and adults encounter at one time or another. Watch carefully, listen closely, and discover what this module is all about.
Frame 11 - Sign is shown: HELP WANTED: CASHIER Qualifications-- 1. 15 years old (or older) 2. Must have the ability to make change properly.	(Music)
Frame 12 - A burd, wearing a coin changer, is shown looking at some coins in her or his hand.	Making change properly means giving the customer change in the fewest coins and bills possible. In this module, you and your classmates will have the opportunity to experiment in making change properly.
Frame 13 - A sign-up sheet for the Junior High School Bake Sale is pictured.	Just suppose that you and five of your friends decide to bake all fifty dozen cookies for the bake sale.

VISUAL	AUDIO
Frame 14 - A recipe for "Mouth-Watering Chocolate Chip Cookies" is pictured.	The recipe that you like best is for three dozen chocolate chip cookies. Would you know how to use this recipe and increase the ingredients to make fifty dozen cookies?
Frame 15 - Some burds are shown shopping for sugar at a grocery store.	First, shopping for the ingredients must be done carefully. In order to determine the best buy, unit pricing can be very helpful, especially if the cookies are to be sold for a profit.
Frame 16 - Some inept burds are shown mixing cookie batter in a bowl (and making a general mess of it).	In this activity, you will discover how to make recipes larger or smaller to suit your needs and to determine unit prices in making your choices in the grocery store.
Frame 17 - A blindfolded burd is shown balancing money and checkbooks on a scale.	Check writing, balancing a checkbook, and keeping a checking account accurate can be easy if you know how. When you start earning your own money, you might want to open a checking account. This activity will help you to get a head start.
Frame 18 - A MATHCO check is pictured.	Your teacher has a MATHCO checking account and a supply of MATHCO checks for you to work with in this activity.

VISUAL	AUDIO
Frame 19 - A burd is shown looking at pictures of bird-baths in a catalog.	Have you ever ordered an item from a catalog? Quite often, items in a catalog cost less money than they would cost in the store.
Frame 20 - A catalog order form is shown.	Filling out a catalog card, itemizing each article you want to order, and figuring out tax and shipping costs will be an activity that you will do in this module.
Frame 21 - Four burds are shown all dressed up and sitting in a fancy restaurant. The waiter is standing by while they try to figure out their check.	Tired of fast-food eating places? Are you in the mood for some real fancy dining out? Let's pretend that we are in the "Ooo La Expenseeve" Restaurant of your choice. How much will the total bill be? How much tax will be added? And what about the tip?
Frame 22 - One of the burds is holding what appears to be a very complicated bill.	It's not really difficult to figure it all out. Your class will take an imaginary trip to a restaurant and deal with the tab.
Frame 23 - A burd wearing a hard hat is shown punching his or her time card at closing time.	Have you ever heard the expression "Well, I'd better go now--it's time to punch the time card"?
Frame 24 - An actual time card is shown.	Time cards record the time a person arrives at work and the time the person leaves. When it's time for the payroll clerk to compute the wages earned that week or month, the information on the time card is used to determine the amount of money earned.

VISUAL	AUDIO
Frame 25 - A payroll clerk burd is shown paying an employee.	You will have the opportunity to be the payroll clerk and issue paychecks in this activity.
Frame 26 - A burd is shown at the scene of the Burd Bowling Tournament.	"I bowled 300 today. A perfect game. All strikes!"
Frame 27 - A MATHCO bowling score sheet is shown.	Does that sound familiar? Most of us don't bowl 300, but it's sure fun to try. Unfortunately, many of us have a little difficulty marking our bowling scores.
Frame 28 - A burd is shown bowling.	In this activity, you may have an opportunity to go to a real bowling alley, or you may have a pretend bowling game in your classroom. One thing for sure, you will get a MATHCO bowling score sheet and learn how to score a bowling game. Sound like fun?
Frame 29 - An Egyptian scene of pyramids and a burd sphinx is shown.	In the land of Egypt, the pyramid was used thousands of years ago as the burying place for the Egyptian pharaohs, or kings. The ancient Egyptians buried their kings in pyramids because they were thought to have special mystical powers. These pyramids were very large. The ancient Egyptians built them by fitting huge stones together. Sometimes it took a pharaoh's lifetime to finish building his pyramid. They were made so strong that they are still standing in the desert in Egypt.

VISUAL	AUDIO
Frame 30 - Burds are shown looking at a paper pyramid hanging over a small plant.	Today, many people think that these pyramid shapes, no matter what size they are, have a special power all their own. Some people believe that food stays fresh longer and plants grow faster when put under a pyramid.
Frame 31 - Burds are shown making paper pyramids.	In this activity, you will construct a pyramid and see if the ancient theory about pyramids works for you.
Frame 32 - A dog is shown looking at the blueprint plans for a doghouse.	Have you ever thought about building a doghouse?
Frame 33 - The dog is shown pleading with some burds to make a doghouse.	What are the steps involved? How would you start?
Frame 34 - The burds are collecting materials for making a doghouse; a happy dog is shown loping along behind them.	In this activity, you will design a doghouse; determine how to cut the various pieces from a sheet of plywood; and compute the cost, volume, and surface area.
Frame 35 - Two burds are pictured looking at wallpaper samples.	Papering or painting a room can be a very expensive venture when you hire a professional to do the job. But have you ever thought of papering a room or painting a room yourself?

VISUAL	AUDIO
Frame 36 - A burd is shown doing a somewhat sloppy job of putting up wallpaper.	In this activity, you will measure a room, determine the amount of paint or wallpaper needed, and do research (or investigative work--that's what research is) as to the price of paint or wallpaper. You may want to determine the cost of floor coverings or rugs, also.
Frame 37 - A burd is pictured thinking about a special friend or relative.	Do you have a really great friend or relative who lives far away who you haven't seen or talked to in a long time?
Frame 38 - The burd is shown with his or her hand on a telephone.	How much would it cost to call long-distance?
Frame 39 - The burd is shown looking up some information in a telephone directory.	Pick the city you'd like to call and examine the front section of your telephone directory to determine the cost of a 15-minute call. Is it the same amount on Monday morning as it is on Monday night? Or how about Sunday night? Or Saturday morning? Or on the 4th of July?
Frame 40 - The burd is shown talking excitedly with the friend or relative.	In this activity, you can discover the best time to call long-distance and the exact amount that it will cost you to call the city of your choice. Remember, be sure to get permission before calling!

VISUAL	AUDIO
Frame 41 - A burd is shown holding a gas pump nozzle.	Of course you've heard about the energy crisis. The supply of gasoline in our country is shrinking, while the price of gasoline continues to rise.
Frame 42 - The burd is shown driving a car.	Suppose you have just purchased a new car. You've filled the gas tank with gasoline and you're taking a trip to visit friends who live 200 miles away.
Frame 43 - The gas gauge on the burd's car reads FULL.	After traveling for about 45 minutes, you notice that your gasoline gauge still registers full.
Frame 44 - The burd looks rather angry.	Well! You know that you've used at least some of the gasoline. But how much? Are you almost out of gas? One thing you do know--this car goes back to the dealer as soon as you get back home, because the gas gauge is broken and must be fixed.
Frame 45 - The burd looks a little bewildered.	In the meantime, how do you determine how much gasoline you have used?
Frame 46 - The burd has pulled off to the side of the road and is shown figuring out how much gas is left in the tank.	In this activity, you'll discover how to determine approximately how much gasoline you have used, how much you have left, and how much farther you can travel before your gas tank is empty.

VISUAL	AUDIO
Frame 47 - The MATHCO narrator is shown.	This has been a preview of the activities you will be doing in this module. These activities include some "close encounters" that you may face with math in your everyday life, both now and in the future.
Frame 48 - Another pose of the MATHCO narrator is shown.	Remember, you must be prepared for these close encounters with math. It takes your time, patience, hard work, and sometimes homework to learn math skills and to be confident about math.
Frame 49 - The MATHCO narrator is shown again in another pose.	Since you will be using math time and time again in your everyday life for as long as you live, think how much better it will be if you can use math successfully.
Frame 50 - A repeat of the baby-sitting cartoon (Frame 2) is shown. This time, the baby-sitter immediately figures out the correct amount that is owed by the adult burd. "Let's see, 4 hours times 85¢ equals $3.40." The baby-sitter looks confident and pleased.	(Music)

VISUAL	AUDIO
Frame 51 - A repeat of the supermarket cartoon (Frame 3) is shown. This time, the burd points to the cheapest unit price and says, "I'll buy this box; it's cheaper by the ounce." A smile is on his or her face.	(Music)
Frame 52 - A repeat of the doghouse cartoon (Frame 4) is shown. This time, the burd is obviously very pleased at how the doghouse turned out. She or he thinks, "It's perfect! I measured exactly right!"	(Music)
Frame 53 - The MATHCO narrator and burd characters are shown as one big, happy group.	(Music)
Frame 54 - (CREDIT FRAME) Audiovisual developers	(Music)
Frame 55 - (CREDIT FRAME)	(Music)
Frame 56 - (CREDIT FRAME) MATHCO developers	(Music)
Frame 57 - (CREDIT FRAME) MATHCO National Review Board	(Music)
Frame 58 - DISCLAIMER	(Music)
Frame 59 - THE END	(Music)

MODULE 4 ACTIVITIES

These MATHCO activities help students discover that basic mathematical concepts already familiar to them are also used in everyday problem-solving situations. Under your guidance, students will also become acquainted with careers that draw upon the math skills they will be using in these activities.

1. MAKING CHANGE Page 19

   Students discover how to make correct change using the least number of coins and bills possible.

   SKILLS USED: Addition, subtraction, and an understanding of multiples of 5, 10, and 25

2. ADJUSTING RECIPES Page 27

   Working with actual recipes, students learn how to increase or decrease the recipes to make the correct amount of food needed to serve a particular number of people.

   SKILLS USED: Multiplication and division of whole numbers and fractions and an understanding of weights and measures

3. UNIT PRICING Page 37

   Students gain experience in determining which purchases to make by using unit pricing.

   SKILLS USED: Division using decimals and an understanding of the fractional parts of one cent

4. WRITING AND RECORDING CHECKS Page 45

   Students learn how to write bank checks correctly and how to record deposits and withdrawals on a check register.

   SKILLS USED: Addition and subtraction

5. ORDERING FROM A CATALOG Page 57

   Students practice filling out actual catalog order forms, computing item costs, sales tax, and shipping charges.

   SKILLS USED: Addition, multiplication, working with money, and a knowledge of how weights are simplified

6. MARKUPS Page 63

Students learn about retailing as they work problems involving markups and profit percentages.

SKILLS USED: Understanding of percentages, multiplying by percents, division using decimals, and finding patterns

7. CHECKING THE CHECK Page 69

A trip to the "MATHCO Deli" will have your students making out food checks and computing the costs of meals, including the tax and the tip.

SKILLS USED: Addition, multiplication, and figuring percentages

8. TIME CARDS Page 77

The MATHCO Time Card Game develops concepts of the relationships among hourly wages, hours worked, and weekly salary.

SKILLS USED: Addition of whole numbers and fractions, using money in multiplication, and working with time (hours, minutes, a.m., and.p.m.)

9. RULES OF BOWLING Page 85

Students learn (or review) the rules of bowling and how to keep score on a bowling score sheet.

SKILLS USED: Addition and averaging

10. BOWLING Page 93

Using the skills they have learned in Activity 9, students have some mock bowling matches and record their scores accurately.

SKILLS USED: Addition, averaging, and following directions

11. PYRAMID POWER Page 101

Students construct cardboard pyramids and conduct an experiment to see if their pyramids have any "mystical" effects on plant growth.

SKILLS USED: Measuring, determining surface area, and graphing

12. BUILDING A DOGHOUSE Page 109

Learning how to plan the construction of a doghouse is the basis of this activity. Students discover the many and varied steps involved in the successful completion of this practical project.

SKILLS USED: Making a scale drawing, application of the Pythagorean theorem, estimating cost, and determining surface area and volume

13. SURFACE AREA (COST OF PAINT AND WALLPAPER FOR A ROOM) Page 115

Students discover that the process of determining how much paint and/or wallpaper is needed to redo the walls and ceiling of a room will, to a large extent, determine the success of such a project.

SKILLS USED: Computing surface area, subtraction, addition, and estimating costs

14. CALLING LONG-DISTANCE Page 121

Students gain experience in determining the cost of a long-distance telephone call and discover the best and least expensive times to call long-distance.

SKILLS USED: Multiplication using money, reading and interpreting charts, and figuring percents

15. AUTO MATH Page 129

Students discover how to calculate miles per gallon by keeping a record of a car's mileage and the amount of gas required at each fill-up.

SKILLS USED: Addition, subtraction, multiplication, division, working with decimals, rounding off numbers, estimating, and an understanding of fractions

MODULE 4, NUMBER 1 - MAKING CHANGE

Teacher Activity Sheet

Overview

Your students will learn how to make change using the least number of coins and bills possible.

Math Skills Your Students Will Need

Addition, subtraction, and an understanding of multiples of 5, 10, and 25.

Time Allotment

One to two class periods (or one class period and homework).

Objectives

Your students will:

1. Reinforce their skills in using money.
2. Reinforce their skills in working with multiples of 5, 10, and 25.
3. Practice mental addition.
4. Gain confidence in using money.

Materials Your Class Will Need

Play or real money (both coins and bills), Making Change Worksheets, and pencils.

Self-Concept Builder

Your students will be working with money, concrete articles with which they are already familiar and that they frequently use. If necessary, permit them to use the play money to obtain their answers.

Activity

1. Go over page one of the Worksheet with the class.
2. On the board, list those rules for making change that your students have discovered and verbalized. Some basic rules that should be included are:

a. Count up from the cost of the item to the amount of money received.

b. Use as few coins as possible. Most people, for example, prefer to receive a quarter instead of five pennies and four nickels. Your students may respond to an approach using these kinds of examples: Don't use more than four pennies, don't use more than one nickel, don't use more than two dimes, etc.

c. Use pennies to get to a multiple of 5.

d. Use nickels and dimes to get to a multiple of 25.

e. Use quarters to complete the amount to the next dollar.

f. Making change using dollars is similar to that using coins, except that there is no twenty-five-dollar bill. Instead, we have $20 and $50 bills to use.

g. A special note: Often, to avoid receiving pennies or to get rid of some pennies that they are carrying around, people will add on some pennies to the amount of money they give the cashier. When this happens, deduct the extra pennies from the purchase price and continue to count up to the amount received minus the pennies.

Have your students write the rules for making change, which have been put on the board, in the space provided on their Worksheets.

3. Using play money (bills and coins), give several of your students an assortment of the coins and bills. With the entire class watching, ask them to give you change for an article you supposedly bought for 22 cents if you gave them each one dollar. Review their change selections and ask the class if they can think of any other coin combinations that might have been used. Repeat this process several times, using different item prices and amounts received, and with other groups of students.

4. Your students are now ready to complete pages two and three of their Making Change Worksheets. Some of your students may need actually to manipulate the play money to find the answers.

5. Inquire to see if your students have discovered any additional rules for making change properly. Discuss these ideas with the class.

Occupations Related to This Activity

What occupations might use an activity similar to this? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

CASHIER: in banks, stores, restaurants, and companies that provide other services to the public (service stations, insurance companies, utility companies, etc.)

INDEPENDENT BUSINESSES: people who baby-sit, mow grass, paint houses, make arts and crafts to sell, etc.

DOOR-TO-DOOR SALESPEOPLE

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

See if you can invent a making-change game that you can play with your friends or brothers and sisters. Remember, if they don't already know how to make change properly, you will need to teach them.

MODULE 4, NUMBER 1 - MAKING CHANGE

Student Activity Sheet

Your Name ______________________________ Date ____________

Overview

In this activity, you will practice making change quickly and efficiently.

Math Skills You Need to Remember

Addition, subtraction, and multiples of 5, 10, and 25.

Things You Will Need

Play money, Making Change Worksheet, and a pencil.

When You Finish You Will Be Able To

Make correct change using the least number of coins and bills possible.

Activity

1. With your teacher, look over page one of your Making Change Worksheet. Together with your class, think about and list the rules you need to remember when making change. Write down these rules on your Worksheet.
2. Practice making change using play money. Remember to COUNT UP from the cost of the item to the amount of money received.
3. Complete pages two and three of your Worksheet. Be sure to ask for help if you have a question. Numbers 10-14 on page three are blank. You are to make up your own problems by filling in whatever amounts you want for item cost and amount received, and then figure out the number of coins and bills, the amount of change, and the total number of coins and bills.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts for more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both women and men enter each of the occupations you've listed above?

Exploring on Your Own

See if you can invent a making-change game that you can play with your friends or brothers and sisters. Remember, if they don't already know how to make change properly, you will need to teach them.

MODULE 4, NUMBER 1 - MAKING CHANGE

Worksheet

There will be many times during your life when you will need to make change for an item purchased or to double-check to make sure someone else has given you the correct change. This can be very easy to do if you know some simple rules that will help you.

Using the least number of coins possible, make change for an item costing $4.33, if you receive a $5 bill from a customer:

ITEM COST: $4.33

MONEY RECEIVED: $5.00

Count up from the cost of the item to the amount of money received.

NUMBER OF COINS

1¢	5¢	10¢	25¢	Total
2	*1*	*1*	*2*	*6*

$4.34, .35 .40 .50 .75, $5.00

Now try another one:

ITEM COST: $4.33

MONEY RECEIVED: $5.03

Subtract the pennies received from the item cost; then count up.

NUMBER OF COINS

1¢	5¢	10¢	25¢	Total
--	--	*2*	*2*	*4*

With your teacher and your class, list some basic rules that you will need to know so that you can make change using the least number of coins and bills possible.

RULES FOR MAKING CHANGE

(Some basic rules are included on pages one and two of your Teacher Activity Sheet.)

Complete the following problems, using the least number of coins possible. The first problem is done for you.

	1.	2.	3.	4.	5.	6.	7.
ITEM COST	$4.33	$9.21	$17.53	$12.16	$3.76	$2.37	$13.13
RECEIVED	$5.00	$10.00	$18.00	$13.00	$4.00	$3.02	$14.03
1¢	2	4	2	4	4	--	--
5¢	1	--	--	1	--	1	1
10¢	1	--	2	--	2	1	1
25¢	2	3	1	3	--	2	3
AMOUNT OF CHANGE	67¢	79¢	47¢	84¢	24¢	65¢	90¢
NUMBER OF COINS	6	7	5	8	6	4	5

	8.	9.	10.	11.	12.	13.	14.
ITEM COST	$8.41	$7.01	$21.50	$ .17	$99.23	$12.77	$50.21
RECEIVED	$9.01	$8.00	$22.00	$1.00	$100.00	$13.00	$51.00
1¢	--	4	--	3	2	3	4
5¢	--	--	--	1	--	--	--
10¢	1	2	--	--	--	2	--
25¢	2	3	2	3	3	--	3
AMOUNT OF CHANGE	60¢	99¢	50¢	83¢	77¢	23¢	79¢
NUMBER OF COINS	3	9	2	7	5	5	7

Complete the following problems, using the least number of coins and bills possible. Again, the first problem is done for you. Make up your own problems for numbers 10-14.

	1.	2.	3.	4.	5.	6.	7.
ITEM COST	$ 7.12	$2.64	$17.49	$23.36	$ 7.28	$ 4.67	$ 9.99
RECEIVED	$10.00	$5.00	$20.00	$30.00	$20.03	$10.02	$20.04
1¢	3	*1*	*1*	*4*	--	--	--
5¢	--	--	--	--	--	--	*1*
10¢	1	*1*	--	*1*	--	*1*	--
25¢	3	*1*	*2*	*2*	*3*	*1*	--
$1	2	*2*	*2*	*1*	*2*	--	--
$5	--	--	--	*1*	--	*1*	--
$10	--	--	--	--	*1*	--	*1*
AMOUNT OF CHANGE	$2.88	*$2.36*	*$2.51*	*$6.64*	*$12.75*	*$5.35*	*$10.05*
NUMBER OF COINS/BILLS	9	*5*	*5*	*9*	*6*	*3*	*2*

	8.	9.	10.	11.	12.	13.	14.
ITEM COST	$16.42	$ 1.79					
RECEIVED	$50.02	$20.04					
1¢	--	--	*(Students make up their own problems for numbers 10-14.)*				
5¢	--	--					
10¢	*1*	--					
25¢	*2*	*1*					
$1	*3*	*3*					
$5	--	*1*					
$10	*3*	*1*					
AMOUNT OF CHANGE	*$33.60*	*$18.25*					
NUMBER OF COINS/BILLS	*9*	*6*					

MODULE 4, NUMBER 2 - ADJUSTING RECIPES

Teacher Activity Sheet

Overview

Because most students enjoy cooking or will need to know how to cook at some time in the future, this activity will show them how recipes can be increased or decreased to make the correct amount of food needed to serve a particular number of people.

Math Skills Your Students Will Need

Understanding of weights and measures and multiplication and division of whole numbers and fractions.

Time Allotment

One to two class periods.

Objectives

Your students will:

1. Reinforce their knowledge of weights and measures.
2. Multiply and divide fractions and whole numbers.
3. Gain some experience in working with metric measures.
4. Follow directions accurately, realizing that this is essential to an edible finished product.

Materials Your Class Will Need

Adjusting Recipes Worksheets and pencils. Note: If this activity is expanded to include the actual cooking of one or more of these recipes, baking supplies and cooking utensils will be necessary.

Vocabulary

liter:	a metric unit of volume that is a little more than a quart
mince:	to cut or chop into very small pieces
recipe:	a set of instructions telling how to make a certain food dish using various ingredients
shortening:	a fat used in cooking or baking
simmer:	to cook gently just below, or just at, the boiling point

Self-Concept Builder

Your students will gain self-confidence as they work in groups of two. If you elect to do some actual cooking, your students will enjoy making the chosen recipes, knowing that they can use these skills at home.

Activity

1. It may be necessary to have a brief review of multiplication and division of fractions and simplifying fractions to mixed numbers.
2. The Adjusting Recipes Worksheets should be completed in class individually. Students may then choose partners with whom to compare answers after both are finished. Have them rework those answers that differ.
3. If your school facilities and time permit, have groups of students actually prepare one or more of these recipes to be enjoyed by the class.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

HOMEMAKER

CHEF

COOK, BAKER

TEACHER IN A CULINARY (COOKING) SCHOOL

RESTAURANT MANAGER

DIETICIAN

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that men and women can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

Choose one of the recipes on your Worksheet or use a recipe from home that you would like to make. Determine how many people you will prepare the recipe for and adjust the recipe amounts to fit. Cook the food for your family or friends, and enjoy!

MODULE 4, NUMBER 2 - ADJUSTING RECIPES

Student Activity Sheet

Your Name ______________________________ Date ______________

Overview

This activity will show you how recipes can be increased or decreased to allow you to prepare the exact amount of food needed.

Math Skills You Need to Remember

How to use weights and measures and multiplication and division of whole numbers and fractions.

Things You Will Need

Adjusting Recipes Worksheet and a pencil.

Vocabulary

liter:	a metric unit of volume that is a little more than a quart
mince:	to cut or chop into very small pieces
recipe:	a set of instructions telling how to make a certain food dish using various ingredients
shortening:	a fat used in cooking or baking
simmer:	to cook gently just below, or just at, the boiling point

When You Finish You Will Be Able To

Adjust any recipe to allow you to prepare the correct amount of food needed for the number of people you intend to serve.

Activity

1. Complete your Adjusting Recipes Worksheet. Be sure to work carefully and to use correct abbreviations (if you don't, you may not want to eat what you've made).
2. Be sure to ask for help if you need it.
3. After you have completed your Worksheet, find a partner and compare answers. Rework any answers that are not the same.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

Choose one of the recipes on your Worksheet or use a recipe from home that you would like to make. Determine how many people you will prepare the recipe for and adjust the recipe amounts to fit. Cook the food for your family or friends, and enjoy!

MODULE 4, NUMBER 2 - ADJUSTING RECIPES

Worksheet

Remember:

Abbreviations

teaspoon	tsp.
tablespoon	tbsp.
cup	c.
pint	pt.
quart	qt.
ounce	oz.
pound	lb.
dozen	doz.
gallon	gal.
liter	l.
milliliter	ml.

Weights and Measures

1 tablespoon = 3 teaspoons
4 tablespoons = 1/4 cup
8 ounces = 1 cup
16 ounces = 1 pound
2 cups = 1 pint
4 cups = 1 quart
4 quarts = 1 gallon
1,000 milliliters = 1 liter

Adjust each of the following recipes to make the amount of food indicated at the top of the column next to the original recipe.

CEREAL PARTY MIX (makes 2 qts.)

	4 qts.	2 gal.	1 1/2 gal.
2 tbsp. Worcestershire sauce	*4 tbsp.*	*8 tbsp.*	*6 tbsp.*
1/4 c. melted margarine or butter	*1/2 c.*	*1 c.*	*3/4 c.*
2 c. round oat cereal	*4 c.*	*8 c.*	*6 c.*
2 c. square, woven wheat cereal	*4 c.*	*8 c.*	*6 c.*
2 c. square, woven rice cereal	*4 c.*	*8 c.*	*6 c.*
2 c. pretzels	*4 c.*	*8 c.*	*6 c.*
12-oz. can mixed nuts	*24 oz.*	*48 oz.*	*36 oz.*
garlic salt			

Mix the margarine, Worcestershire sauce, and a liberal sprinkling of garlic salt in a large, shallow baking pan. When they are mixed, add the rest of the ingredients and stir until well coated. Bake for 45 minutes at 250°F.

METRIC PICNIC APPLES (makes 6 apples)

	24 apples	48 apples	27 apples
6 large apples	24	48	27
60 ml. raisins	240 ml.	480 ml.	270 ml.
250 ml. cottage cheese	1 l.	2 l.	1 l., 125 ml.
60 ml. nuts	240 ml.	480 ml.	270 ml.
15 ml. mayonnaise	60 ml.	120 ml.	67.5 ml.

Cut off the tops of the apples and put them aside until later. Carefully scoop out the insides of the apples. Remove the apple cores and chop up the good parts of the apples you have scooped out. Mix the chopped apple parts with the other ingredients. Stuff this mixture back into the apples and put the tops back on. Chill well before serving.

RANGER COOKIES (makes 3 doz.): chewy on the inside, crispy on the outside

	9 doz.	4 1/2 doz.	126 cookies
1/2 c. shortening	1 1/2 c.	3/4 c.	1 3/4 c.
1/2 c. granulated sugar	1 1/2 c.	3/4 c.	1 3/4 c.
1/2 c. brown sugar (packed)	1 1/2 c.	3/4 c.	1 3/4 c.
1 egg	3	1 1/2	3 1/2
1/2 tsp. vanilla	1 1/2 tsp.	3/4 tsp.	1 3/4 tsp.
1 c. all-purpose flour	3 c.	1 1/2 c.	3 1/2 c.
1/4 tsp. baking powder	3/4 tsp.	3/8 tsp.	7/8 tsp.
1/4 tsp. salt	3/4 tsp.	3/8 tsp.	7/8 tsp.
1 c. quick-cooking oats	3 c.	1 1/2 c.	3 1/2 c.
1 c. fortified whole wheat flake cereal	3 c.	1 1/2 c.	3 1/2 c.
1/2 c. shredded coconut	1 1/2 c.	3/4 c.	1 3/4 c.

Heat oven to 375°F. Mix together thoroughly the shortening, granulated sugar, brown sugar, egg, and vanilla. Sift together in another bowl the flour, baking powder, and salt. Add flour mixture to sugar mixture and mix well. Stir in the remaining ingredients. Drop the dough by rounded teaspoonsful two inches apart on an ungreased baking sheet. Bake for 10 minutes. Remove cookies immediately from baking sheet.

LASAGNA (serves 8 to 10)	To serve 16 to 20
1 lb. ground beef or Italian sausage	*2 lb.*
1 clove garlic, minced	*2 cloves*
1 tbsp. dried, crushed basil	*2 tbsp.*
1 1/2 tsp. salt	*3 tsp. or 1 tbsp.*
1 1-lb. can tomatoes	*2 1-lb. cans*
2 6-oz. cans tomato paste	*4 6-oz. cans*
1 lb. lasagna noodles	*2 lb.*
2 eggs	*4 eggs*
3 c. fresh ricotta cheese or cream-style cottage cheese	*6 c.*
1/2 c. grated Parmesan or Romano cheese	*1 c.*
2 tbsp. parsley flakes	*4 tbsp.*
1 tsp. salt	*2 tsp.*
1/2 tsp. pepper	*1 tsp.*
1 lb. mozzarella cheese, grated or sliced very thin	*2 lb.*

1. Preheat oven to 375°F. Brown meat slowly in a large skillet and spoon off excess fat. Add the next five ingredients. Simmer uncovered for 30 minutes, stirring occasionally.
2. Cook noodles in a large amount of boiling, salted water until they are tender. Drain the noodles and rinse them under tap water. Place noodles on paper towels to drain.
3. In a separate bowl, beat eggs. Add all remaining ingredients except the mozzarella cheese.
4. Layer about 1/3 of the noodles in a 13 x 9 x 2-inch baking pan or dish. Spread with half the ricotta filling, half the mozzarella cheese, and half the meat sauce. Repeat with another layer of noodles and ingredients. End with the last 1/3 of the noodles, sprinkled with a little meat sauce and mozzarella cheese.
5. Bake at 375°F for about 40 minutes. Let lasagna stand for 10 minutes before cutting and serving. Leftovers can be frozen.

EASY MEXICALI DINNER (makes 6 servings)

	12 servings	3 servings
1 lb. ground beef	*2 lb.*	*1/2 lb.*
1/2 c. chopped onion	*1 c.*	*1/4 c.*
6 oz. medium-sized noodles, cooked and drained	*12 oz.*	*3 oz.*
1 1-lb. can tomatoes	*2 1-lb. cans*	*1/2 1-lb. can (8 oz.)*
1 6-oz. can tomato paste	*2 6-oz. cans*	*1/2 6-oz. can (3 oz.)*
1 1/2 c. shredded sharp processed American cheese	*3 c.*	*3/4 c.*
1/2 c. sliced ripe olives	*1 c.*	*1/4 c.*
1 tsp. salt	*2 tsp.*	*1/2 tsp.*
1/4 tsp. dried basil, crushed	*1/2 tsp.*	*1/8 tsp.*
1/8 tsp. pepper	*1/4 tsp.*	*1/16 tsp.*

1. Preheat oven to 350°F. Cook meat and onion in a large skillet until meat is browned and onion is tender. Drain off grease.
2. Stir in the noodles, tomatoes, tomato paste, 1 cup of the shredded cheese, olives, and seasonings (salt, basil, and pepper).
3. Put mixture into a 2-quart casserole dish and top with the remaining 1/2 c. of the shredded cheese. Bake for 45 minutes or until very hot.

What size casserole dish would you use to serve 12 people?	*4 qt.*
What size casserole dish would you use to serve 3 people?	*1 qt.*
When making the recipe to serve 12, how much of the shredded cheese would you stir into the mixture?	*2 c.*
How much cheese would be left for the top?	*1 c.*
When making the recipe to serve 3, how much of the shredded cheese would you stir into the mixture?	*1/2 c.*
How much cheese would be left for the top?	*1/4 c.*

EARLY AMERICAN CORN BREAD (serves 8)

	To serve 16	To serve 4
1 1/2 c. unsifted all-purpose flour	*3 c.*	*3/4 c.*
3 tsp. baking powder	*6 tsp. or 2 tbsp.*	*1 1/2 tsp.*
1 tsp. salt	*2 tsp.*	*1/2 tsp.*
1/2 c. sugar	*1 c.*	*1/4 c.*
1/4 c. softened butter or margarine	*1/2 c.*	*1/8 c.*
2 eggs	*4 eggs*	*1 egg*
1 c. canned pumpkin	*2 c.*	*1/2 c.*
1/2 can evaporated milk[*]	*1 can*	*1/4 can*
1 c. yellow cornmeal	*2 c.*	*1/2 c.*
1 c. blueberries[†]	*2 c.*	*1/2 c.*
1/2 c. coarsely chopped walnuts	*1 c.*	*1/4 c.*

1. Preheat oven to 350°F. Lightly grease a 9 x 5 x 2 3/4-inch loaf pan. Pan size should be adjusted to fit the amount of corn bread being made.
2. Sift flour with the baking powder and salt. Set aside.
3. In a large bowl, use a rotary beater to mix the sugar, butter, and eggs until smooth. Add pumpkin, milk, and cornmeal. Beat until smooth.
4. With a wooden spoon, stir in the flour mixture, and mix just until all ingredients are combined. Gently stir in the blueberries and the walnuts.
5. Put batter into the greased pan, spreading evenly. Bake for one hour, or until a cake tester or toothpick inserted into the center comes out clean.
6. Let cool in the pan on a cooling rack for 10 minutes. Remove from pan. Serve slightly warm.

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[*] Full can of evaporated milk equals 13 1/2 oz.

[†] Use frozen, unsweetened blueberries that have been thawed and drained.

MODULE 4, NUMBER 3 - UNIT PRICING

Teacher Activity Sheet

Overview

Your students will gain experience in determining how to buy items by using unit pricing. They will learn how to spend the least amount of money for the greatest amount of whatever it is they need.

Math Skills Your Students Will Need

Division using decimals and an understanding of the fractional parts of one cent.

Time Allotment

Two to three class periods plus out-of-class investigation.

Objectives

Your students will:

1. Compare similar products to determine the best buy.
2. Compute unit prices.
3. Reinforce skills in division with decimals.
4. Apply a mathematical concept in a practical way.
5. Reinforce skills in working with money.

Materials Your Class Will Need

A list of the sizes and prices of two types of items found in a grocery store or drugstore (ask students to choose only those items that have weights listed on the packages), Unit Pricing Worksheets, and pencils.

Vocabulary

comparison shopping:	shopping for an item by comparing the costs and extra features of several similar items, with an eye to finding the best buy
unit pricing:	the amount of money an item costs per unit; most often, unit pricing tells the buyer how much an item costs per ounce, per pound, or per single item; many grocery stores around the country have the unit price of each item posted on the shelves

Self-Concept Builder

Each student will investigate unit pricing of items of his or her choice. Because the selection of items is an individual one, answers will vary depending on the items chosen, and the pressure to attain a single, correct answer will be minimized.

Activity

1. Prior to the day the Unit Pricing Worksheets are to be completed, assign students to visit a grocery story or drugstore. They are to choose two types of products with which to conduct their unit price study. An example might be toothpaste and peanut butter. Check over these choices to make sure they have picked items that are packaged and not already unit priced. While at the store, the students must make a list of the various brands of a particular product, the sizes it comes in, and the price of each size. Have them bring their information in to class.
2. Review the meaning of unit pricing and have the students see if they can figure out how to arrive at a unit price.

$$\frac{\text{price}}{\text{size}} = \text{unit price}$$

Example: Natural grain cereal costs $1.09 for a one-pound package.

$$\frac{\$1.09}{16\text{ oz.}} = \$\ .068125 \text{ per ounce} = \text{approximately } \$\ .07, \text{ or } 7¢ \text{ per ounce}$$

3. Have students, using their own products, complete their Unit Pricing Worksheets. Class discussion should follow.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

GAS STATION OWNER
SUPERMARKET OR STORE MANAGER OR OWNER
AGRICULTURAL WHOLESALER
GOVERNMENT CONSUMER AGENT
EVERYONE WHO BUYS GROCERIES
CONSUMER ADVOCATE
MERCHANDISE WHOLESALER

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that men and women can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

1. Find out more about comparison shopping and consumer reports.
2. Promote unit pricing in your city or town if it is not being used at this time.
3. Help unit price your school store or school vending machines.
4. You may want to volunteer to help a local grocery store or drugstore unit price the most commonly purchased item in that store.

MODULE 4, NUMBER 3 - UNIT PRICING

Student Activity Sheet

Your Name ______________________________ Date ____________

Overview

In this activity, you will discover how comparing unit prices allows you to pay the lowest price possible for a product or item.

Math Skills You Need to Remember

Division using decimals and an understanding of the fractional parts of one cent.

Things You Will Need

A list of the sizes and prices of two types of items found in a grocery store or drugstore, Unit Pricing Worksheet, and a pencil.

Vocabulary

comparison shopping:	shopping for an item by comparing the costs and extra features of several similar items, with an eye to finding the best buy
unit pricing:	the amount of money an item costs per unit; most often, unit pricing tells the buyer how much an item costs per ounce, per pound, or per single item; many grocery stores around the country have the unit price of each item posted on the shelves

When You Finish You Will Be Able To

Compare items or products to determine the best buy, through figuring out their unit prices.

Activity

1. Visit a grocery store or drugstore. Choose two items on which to conduct your unit pricing study, for example, peanut butter and toothpaste.

2. While at the store, make a list of the various brands of each of your products, the sizes they come in, and the price of each size. Bring this information to class.
3. Complete your Unit Pricing Worksheet. Be sure to ask for help if you need it.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

1. Find out more about comparison shopping and consumer reports.
2. Promote unit pricing in your city or town if it is not being used at this time.
3. Help unit price your school store or school vending machines.
4. You may want to volunteer to help a local grocery store or drugstore unit price the most commonly purchased item in that store.

MODULE 4, NUMBER 3 - UNIT PRICING

Worksheet

On this chart, list neatly the names of all the items you have chosen, the sizes available, and the price of each item. Compute the unit price for each item. (If you arrange your items [e.g., peanut butter and toothpaste] in two groups, each from the smallest to the largest size, you will get the clearest picture of unit pricing increases and decreases.)

NAME OF ITEM	SIZE	PRICE	UNIT PRICE

Let's see what you have discovered.

1. Which product was the least expensive per unit for each of the sizes in which it is made?

2. What happened to the unit price as the size or quantity of the product increased?

   Usually, the unit price decreases.

   Did everyone in your class find this to be true?

   Why do most unit prices get less expensive as the size or quantity gets larger?

   The cost of packaging is less. Companies like customers to buy larger quantities of their products, and so charge less.

   What could happen if you always assumed this to be true?

   A particular product might not follow this pattern and you would (a) pay more for the larger quantity and (b) buy more than you need and still not save any money.

3. Is there a way that you can accurately compute unit pricing in your head? Team up with another student and read him or her the size and the price of one of the items from your list. See if she or he can tell you the unit price to the nearest cent. Each of you do several of them and see how good you can become at it.

4. Is there ever an instance when buying the largest size is not economical (even when the unit price is the lowest in cost)?

   Yes, when you don't need large quantities and the item may spoil or never even be used.

MODULE 4, NUMBER 4 - WRITING AND RECORDING CHECKS

Teacher Activity Sheet

Overview

Your students will gain experience in writing bank checks and will learn how to record information on a check register.

Math Skills Your Students Will Need

Addition and subtraction.

Time Allotment

Two class periods.

Objectives

Your students will:

1. Write checks for specific amounts of money.
2. Record and balance information on a check register.
3. Reinforce addition and subtraction skills.
4. Gain knowledge about the kinds of expenses that are entailed in day-to-day living.
5. Understand the function of a checkbook.
6. Work individually and in pairs.

Materials Your Class Will Need

Writing and Recording Checks Worksheets, MATHCO checks, and pencils.

Vocabulary

check:	a written order requesting a bank to pay a certain amount of money to someone from funds on deposit in a person's bank account
deposit:	an amount of money to be put into a person's bank account
balance:	the amount of money that remains in a bank account after all deposits and checks have been added and subtracted

Self-Concept Builder

Your students will be working with concepts of definite interest to them.

Activity

DAY ONE

1. Discuss the meaning of the vocabulary words with your students. Encourage all students to participate.
2. With your students, discuss the many reasons why the use of bank checks is so widespread. Ask them to think of occasions when check writing is a convenient way to pay for purchases. Direct their attention to the safety factor (not having to carry large sums of money on one's person, etc.).
3. Now, direct your students to the first three pages of the Worksheet. Many students will be able to complete this Worksheet independently, but some students will need help. Encourage them to ask for help if they need it. You should circulate among them and offer assistance where needed.
4. After this activity is finished, you and your students should review the completed part of the Worksheet. The final "check yourself" items should lead to a good class discussion.

DAY TWO

1. With your students, make up and write on the blackboard a list of checks (names, amounts, and dates), as well as deposits they might encounter as adults. It would be advisable to decide upon a background for the type of person a student might be (student, married or unmarried, types of job, income level, etc.). Try to make the expenses realistic in light of the particular situation(s) decided upon as a class.
2. Have your students decide upon a beginning balance to enter in the top right-hand corner of their check registers. Then they should fill out all check amounts and dates listed on the board on their blank MATHCO checks. Show students some real blank checks so they can see where printed check sequence numbers appear. Explain sequencing. Individual checks should be numbered (1001, 1002, etc.) in the top right-hand corners. Now they are ready to enter the check amounts and deposits in their check registers, using the information from the board.
3. Look over students' checks and check registers as they are completing them to make sure they understand the procedure.
4. If time permits, let students work in groups of two, and repeat steps two and three on their own, choosing another life-style, income level, and set of expenses. You must supply another copy of checks and registers.

Occupations Related to This Activity

What occupations might use an activity similar to this? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

ACCOUNTANT

ANYONE WHO USES A CHECKBOOK FOR PERSONAL OR BUSINESS ACCOUNTING

BANKER

FINANCIAL ADVISOR

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activity

(This suggestion appears on Student Activity Sheets.)

You may want to discuss this activity with your parents or guardians to find out more about how much it costs to run a household, feed a family, buy clothing, etc. It may make you think twice the next time you are tempted to ask them to buy you something that you don't really need or that is too expensive.

MATHCO checks (for Teacher's Use)

Teachers: You will probably need to reproduce two or three copies per student of the checks on the following page; separate checks with a paper cutter.

+ = × ÷

____________________19____

PAY TO THE
ORDER OF ____ $__________

____ DOLLARS

MATHCO
NATIONAL BANK
AnyCity, U.S.A.

memo ______________________ ______________________

I:0310--00051I: II" 550 508 7II" 71099

+ = × ÷

____________________19____

PAY TO THE
ORDER OF ____ $__________

____ DOLLARS

MATHCO
NATIONAL BANK
AnyCity, U.S.A.

memo ______________________ ______________________

I:0310--00051I: II" 550 508 7II" 71099

+ = × ÷

____________________19____

PAY TO THE
ORDER OF ____ $__________

____ DOLLARS

MATHCO
NATIONAL BANK
AnyCity, U.S.A.

memo ______________________ ______________________

I:0310--00051I: II" 550 508 7II" 71099

MODULE 4, NUMBER 4 - WRITING AND RECORDING CHECKS

Student Activity Sheet

Your Name ______________________________ Date __________

Overview

In this activity, you will write bank checks, record the amounts of the checks and deposits on a check register, and balance the register. This activity will give you a useful head start in preparing you for the day when you open your own checking account.

Math Skills You Need to Remember

Addition and subtraction.

Things You Will Need

Writing and Recording Checks Worksheet, MATHCO checks, and a pencil.

Vocabulary

check:	a written order requesting a bank to pay a certain amount of money to someone from funds on deposit in a person's bank account
deposit:	an amount of money to be put into a person's bank account
balance:	the amount of money that remains in a bank account after all deposits and checks have been added and subtracted

When You Finish You Will Be Able To

Write a check correctly and use and balance a check register.

Activity

DAY ONE

1. Your teacher will lead your class in a discussion of the meaning of the vocabulary words for this activity. Your ideas are important, so be sure to share them with your classmates and teacher.

2. Why do so many people use checks? When is it more convenient to write a check than to use cash? When is it safer to have a checkbook in your pocket, wallet, or purse than to have cash? Your teacher will be asking your class these questions and will want to hear your opinions.
3. Now, see if you can complete the Writing a Check part of the Worksheet. If you need help, raise your hand and your teacher will help you.
4. After you have finished page three of the Worksheet, your class will review this activity. Discuss what you discovered about check writing with your classmates and teacher.

DAY TWO

1. With your teacher and classmates, help make up a list of expenses to be paid by check and a list of deposits.
2. Use the information on the blackboard to fill out your MATHCO checks and the check register on page four of the Worksheet. Be sure to talk to your teacher if you have any questions.
3. After completing your Worksheet, team up with a classmate and make up another set of expenses to be paid by check and registered. Remember to set a life-style first and live within your income.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

You may want to discuss this activity with your parents or guardians to find out more about how much it costs to run a household, feed a family, buy clothing, etc. It may make you think twice the next time you are tempted to ask them to buy you something that you don't really need or that is too expensive.

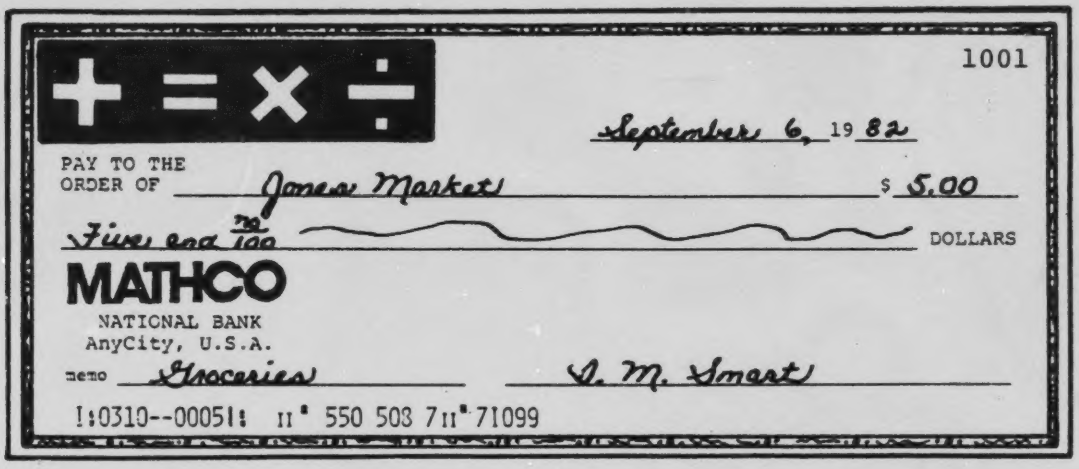
MODULE 4, NUMBER 4 - WRITING AND RECORDING CHECKS

Worksheet

WRITING A CHECK

A check is a written order requesting your bank to pay a certain amount of money out of the funds on deposit in your bank account.

Example: I. M. Smart purchased groceries at Jones Market on September 6, 1982. The total amount of the purchase was $5.00.



1001

September 6, 19 82

PAY TO THE ORDER OF Jones Market $ 5.00

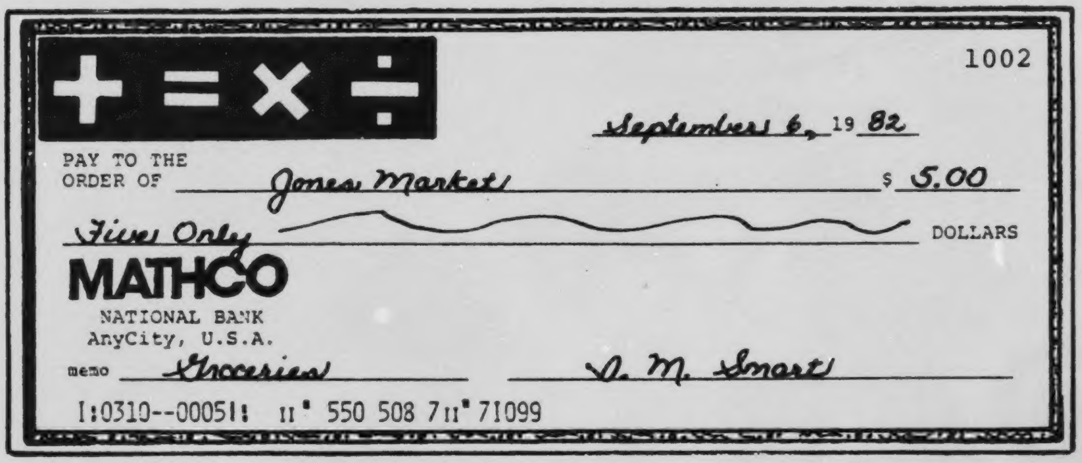
Five and no/100 DOLLARS

MATHCO NATIONAL BANK AnyCity, U.S.A.

memo Groceries I. M. Smart

I:0310--00051I: II' 550 508 7II'71099

Another way of writing this check amount is as follows:



1002

September 6, 19 82

PAY TO THE ORDER OF Jones Market $ 5.00

Five Only DOLLARS

MATHCO NATIONAL BANK AnyCity, U.S.A.

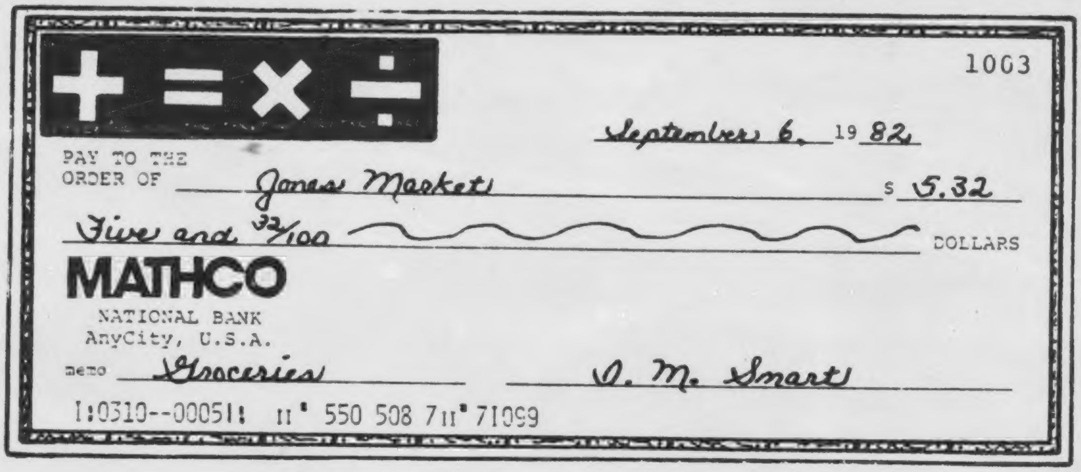
memo Groceries I. M. Smart

I:0310--00051I: II' 550 508 7II'71099

How does Check #1001 differ from Check #1002? __________

"Only" replaces "and no/100"; they have the same meaning.

Suppose I. M. Smart's total purchase amounted to $5.32? Then the check amount entry would be written as follows:



1003

September 6, 19 82

PAY TO THE ORDER OF Jones Market $ 5.32

Five and 32/100 DOLLARS

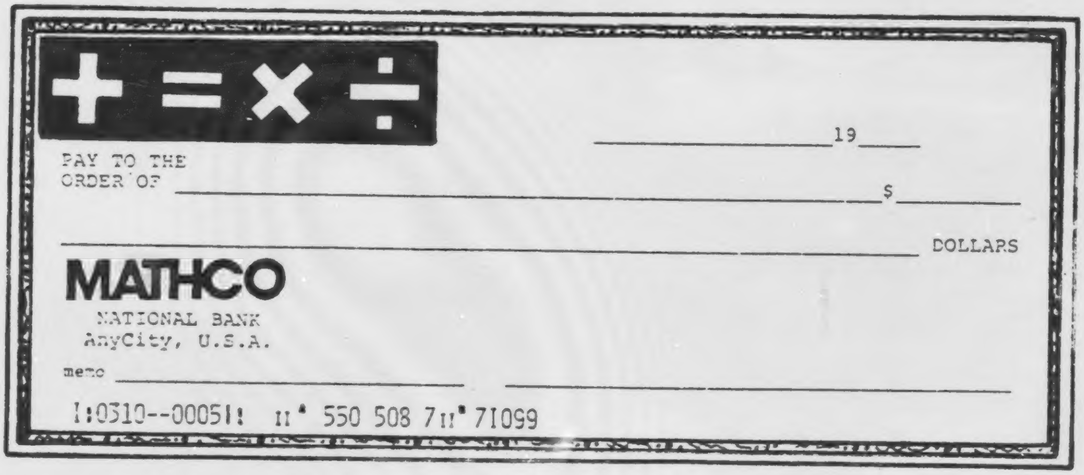
MATHCO
NATIONAL BANK
AnyCity, U.S.A.

memo Groceries

I. M. Smart

I:0310--00051I: II' 550 508 7II'71099

Now it's time for you to practice writing a check. Let's just suppose that you have purchased a yearbook at your school. The total price is $10.50. Make this check out to Yearbook, using today's date. Sign your name.



19

PAY TO THE ORDER OF $

DOLLARS

MATHCO
NATIONAL BANK
AnyCity, U.S.A.

memo

I:0310--00051I: II' 550 508 7II'71099

CHECK YOURSELF

Now check yourself to determine if you filled out the check properly.

1. Is the check properly dated? ____________________

2. Did you fill in a check number at the top of the check?

   ____________ (Usually checks are already numbered when your bank sends them to customers, but these MATHCO checks are not numbered.)

3. Does the amount on the top line ($__________) match the amount written on the next line (________________________DOLLARS)?

   ____

4. Does your wavy line (∿∿∿∿∿∿∿∿) fill up all the vacant space on that line? _______________ This is important.

   Sometimes a dishonest person could alter (change or add to) what you have written on your check if there were space left. So, in order to protect your money, never leave empty spaces on your checks!

RECORDING CHECKS

CHECK REGISTER

BALANCE

Check Number	Date	Checks issued to, or description of deposit	Amount of Check	Amount of Deposit	$ 569.93
1001	Sept. 6 1982	Jones Market	$ 5.00		- 5.00
		(groceries)	▨	▨	564.93
1002	Sept. 13 1982	First National Bank	127.50		- 127.50
		(car loan)	▨	▨	437.43
1003	Sept. 15 1982	Manor Apartments	285.00		- 285.00
		(rent)	▨	▨	152.43
	Sept. 21 1982	Paycheck		$ 504.00	+ 504.00
			▨	▨	656.43
1004	Sept. 24 1982	Clean-O-Rama	11.75		- 11.75
		(dry cleaning)	▨	▨	644.68
			▨	▨	
			▨	▨	
			▨	▨	
			▨	▨	
			▨	▨	

MODULE 4, NUMBER 5 - ORDERING FROM A CATALOG

Teacher Activity Sheet

Overview

Your students will practice filling out a catalog order form correctly.

Math Skills Your Students Will Need

Knowledge of how weights are simplified, working with money, addition, and multiplication.

Time Allotment

Two to three class periods.

Objectives

Your students will:

1. Practice filling out order forms.
2. Follow directions.
3. Work in small groups.
4. Compute tax on the cost of various items.
5. Reinforce their skills in working with money.

Materials Your Class Will Need

Mail-order catalogs (one for each two or three students),* order forms for the catalogs used, and pencils.

Vocabulary

mail-order house:	a store that conducts its business through the mail
catalog:	a book that contains a list of items arranged in some kind of order (in categories or alphabetically) and that also describes each item and states its cost; mail-order houses send out catalogs so that their customers will know what is for sale

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*You should order several catalogs weeks in advance of this activity or your students could bring catalogs from home.

Self-Concept Builder

Your students will work in small groups and can help each other. Selections of items will be made by each group so as to make the activity more interesting and personal.

Activity

1. Group students in pairs or threes to work with the catalogs. Run off an order blank for each student, corresponding with the catalogs she or he will be using. A catalog requiring that weight charges be computed is preferred.
2. Allow students to choose their own items from the catalog, as long as they decide as a group upon the particular items and order more than one of each item.
3. Instruct them to fill out the order blank carefully, writing in all the necessary information. Make sure they are especially careful in computing the tax and shipping weight, so that they will put in the correct amounts.
4. Have each student exchange an order blank with another student to double-check his or her work.
5. Ask your students if they have any suggestions about completing an order form correctly. (Usually they will say, "Do it in pencil, for one thing!")
6. If time permits, have your students exchange catalogs (if your class is using several kinds), and repeat steps 2 to 4.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

BILLING CLERK
SHIPPING CLERK
WAREHOUSE MANAGER
SECRETARY
INVENTORY SPECIALIST
MAIL-ORDER DEPARTMENT CLERK

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that men and women can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

The next time anyone in your family is ordering something through the mail, offer to fill out the order blank or volunteer to check over the form to see if any errors have been made.

MODULE 4, NUMBER 5 - ORDERING FROM A CATALOG

Student Activity Sheet

Your Name ______________________________ Date ____________

Overview

In this activity, you will learn how to fill out an order form from a mail-order catalog.

Math Skills You Need to Remember

Knowledge of how weights are simplified, working with money, addition, and multiplication.

Things You Will Need

A mail-order catalog (which you will be sharing with one or two other students),* an order form from that catalog, and a pencil.

Vocabulary

mail-order house:	a store that conducts its business through the mail
catalog:	a book that contains a list of items arranged in some kind of order (in categories or alphabetically) and that also describes each item and states its cost; mail-order houses send out catalogs so that their customers will know what is for sale

When You Finish You Will Be Able To

Fill out accurately an order blank from a mail-order catalog.

Activity

1. With your group, choose several items you would like to order by mail from your catalog. All of the people in your group must agree to order these items. Buy as many items as will fit on your order form, and order more than one of each item.

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*Your teacher may ask you to bring a catalog from home.

2. Carefully fill out the order form by writing in all of the necessary information. Be especially careful to compute the tax and shipping weight correctly.
3. When you are finished, exchange your order form with another member of your group, and check each other's work for accuracy.
4. Be prepared to discuss with your class your suggestions and discoveries about how best to complete an order form.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

The next time anyone in your family is ordering something through the mail, offer to fill out the order blank or volunteer to check over the form to see if any errors have been made.

MODULE 4, NUMBER 6 - MARKUPS

Teacher Activity Sheet

Overview

Your students will mark up items as if they were owners of a retail store. They will also study profit percentages.

Math Skills Your Students Will Need

Understanding percentages, multiplying by percents, division using decimals, and finding patterns.

Time Allotment

Two class periods.

Objectives

Your students will:

1. Compute percentages.
2. Apply markups and discounts to prices of items.
3. Determine profits.
4. Find unit prices.

Materials Your Class Will Need

Markups Worksheets and pencils.

Vocabulary

overhead:	the operating expenses of a business; these include rent, utilities, wages of employees, freight charges, etc.
markup:	the amount added to the cost of an item when a store figures out the selling price of that item; stores mark up prices on items to ensure that they can pay their overhead and also to make a profit

Self-Concept Builder

Your students will gain confidence as they progress from the easier exercises to the more difficult ones.

Activity

1. Give your students a little background information about how stores mark up the prices of their goods to cover their overhead and to make a profit. When the overhead is deducted from the marked up goods that have been sold, the remaining money is the profit.
2. Have your students complete their Markups Worksheets. They may work independently or in pairs, at your discretion.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

STORE OWNER STORE MANAGER

ANYONE SELLING ITEMS OR SERVICES TO THE PUBLIC: artists, restaurant owners, consultants, car companies, computer companies, equipment companies, etc.

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

You may want to visit several stores and discuss the markup policy with the stores' owners or managers. Find out if all stores mark up prices on items the same amount, or if stores and items vary in percent of markup.

MODULE 4, NUMBER 6 - MARKUPS

Student Activity Sheet

Your Name ______________________________ Date ____________

Overview

This activity will help you understand the markup process of retail stores.

Math Skills You Need to Remember

Understanding percentages, multiplying by percents, division using decimals, and finding patterns.

Things You Will Need

Markups Worksheet and a pencil.

Vocabulary

overhead:	the operating expenses of a business; these include rent, utilities, wages of employees, freight charges, etc.
markup:	the amount added to the cost of an item when a store figures out the selling price of that item; stores mark up prices on items to ensure that they can pay their overhead and also to make a profit

When You Finish You Will Be Able To

Understand how and why retail stores mark up item costs.

Activity

1. Discuss the vocabulary words listed above with your teacher and class.
2. Complete your Markups Worksheet. Be sure to ask for assistance if you need it.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both women and men enter each of the occupations you've listed above?

Exploring on Your Own

You may want to visit several stores and discuss the markup policy with the stores' owners or managers. Find out if all stores mark up prices on items the same amount, or if stores and items vary in percent of markup.

MODULE 4, NUMBER 6 - MARKUPS

Worksheet

Use the information that is given to you to complete this Worksheet. Round your answers to the nearest hundredth.

				$\frac{\text{MARKUP}}{\text{selling cost}} = \%$	$\frac{\text{MARKUP}}{\text{item cost}} = \%$
	ITEM COST	SELLING PRICE	MARKUP	% of markup to item cost	% of markup to selling price
1	$10	$15	$5	50%	33 1/3%
2	$5	$10	$5	100%	50%
3	$15	$20	$5	33 1/3%	25%
4	$30	$50	$20	66 2/3%	40%
5	$40	$90	$50	125%	55.6%
6	$36	$40	$4	11.1%	10%
7	$8	$10	$2	25%	20%
8	$54	$59.40	$5.40	10%	9%
9	$10	$10.50	$ .50	5%	4.8%
10	$75	$112.50	$37.50	50%	33 1/3%
11	$64	$76.80	$12.80	20%	16 2/3%
12	$8	$10	$2	25%	20%
13	$20	$40	$20	100%	50%
14	$13.50	$18	$4.50	33 1/3%	25%

Double-check your answers to make sure they are correct.

Can you find any relationship(s) between the percent of markup to item cost and the percent of markup to selling price?

Yes. The markup to selling price is always less than the markup to item cost.

MODULE 4, NUMBER 7 - CHECKING THE CHECK

Teacher Activity Sheet

Overview

Your students will make out a food check and compute the cost of the meal, including the tax and the tip.

Math Skills Your Students Will Need

Addition, multiplication, and figuring percentages.

Time Allotment

One to two class periods.

Objectives

Your students will:

1. Gain experience in writing food checks.
2. Learn the importance of checking a food check for errors before paying the bill.
3. Compute sales tax and tip.
4. Gain practice in checking addition for accuracy.

Materials Your Class Will Need

Checking the Checks Worksheets and pencils.

Vocabulary

deli:	this is an abbreviation for delicatessen, a place where ready-to-eat foods may be eaten or may be bought and taken home to eat
food check:	the order form used by a waitress or waiter to record the food you order, to show the cook what food to fix, and finally, to hand back to you so that you know how much you need to pay for your meal
menu:	a list of the food items that a particular restaurant is prepared to serve its customers
tip:	a sum of money (usually 15 percent of the total cost of a meal--not including the tax) given to the waiter or waitress to acknowledge your appreciation of courteous and efficient service

Self-Concept Builder

Experience in handling a restaurant situation is something that all students should enjoy. Since all students will be active participants in this activity, they will feel totally involved and have a real incentive to be accurate in their calculations.

Activity

1. In groups of two or three, each student should look at the menu and order a meal while everyone in that group (including that student) writes down the order. If there are any doubles or triples of an item, make tallies next to the selection, rather than numbers. This avoids having to cross out the number if more than one of an item is ordered (/ = 1, // = 2, /// = 3, etc.). Continue around the group until each student has given a complete order.
2. Your students should then:
   a. Fill in the price for each item according to the menu, based upon how many people ordered the item.
   b. Subtotal the check.
   c. Determine the sales tax by multiplying the subtotal by 5 percent and rounding off to the nearest penny. (If your state's sales tax is different, you might want to have your students work with that figure.)
   d. Compute the total cost of the food check.
   e. Figure out what the tip would be by multiplying the subtotal by 15 percent. Normally the tip is computed without including the tax in the calculation.
   f. Compare their answers with those of the other members of their group and refigure those answers that differ (if any).
3. Combine each small group with another one, so that there are now four to six people in each group. Repeat steps 1 and 2.
4. Combine three of the original small groups to form groups of six to nine people. Repeat steps 1 and 2.
5. Discuss with your class why accuracy is important in writing and checking over a food check. The cook may prepare too much or too little food; the cook may prepare the wrong item; the customer may pay too much or too little; the restaurant employee writing the check is often responsible if a customer is undercharged and may have to pay that amount out of his or her salary.

Occupations Related to This Activity

What occupations might use an activity similar to this? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

WAITER OR WAITRESS

CATERER

HOTEL OR MOTEL CLERK

CHEF OR COOK

RESTAURANT MANAGER

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

MODULE 4, NUMBER 7 - CHECKING THE CHECK

Student Activity Sheet

Your Name ______________________________ Date ____________

Overview

In this activity, you will discover how restaurant employees record and add up a food check and how you (the customer) can make sure the food check is accurate.

Math Skills You Need to Remember

Addition, multiplication, and figuring percentages.

Things You Will Need

Checking the Check Worksheet and a pencil.

Vocabulary

deli:	this is an abbreviation for delicatessen, a place where ready-to-eat foods may be eaten or may be bought and taken home to eat
food check:	the order form used by a waitress or waiter to record the food you order, to show the cook what food to fix, and finally, to hand back to you so that you know how much you need to pay for your meal
menu:	a list of the food items that a particular restaurant is prepared to serve its customers
tip:	a sum of money (usually 15 percent of the total cost of a meal--not including the tax) given to the waiter or waitress to acknowledge your appreciation of courteous and efficient service

When You Finish You Will Be Able To

Write up a food check and compute the cost, including tax and tip.

Activity

1. Your teacher will group you with two or three other students. Each of you should take turns ordering a complete meal while everyone in the group (including the student ordering) writes down the order. If there is more than one order for an item, make tallies next to the selection, rather than numbers. This avoids having to cross out the number if more than one is ordered (/ = 1, // = 2, /// = 3, etc.). Continue around the group until each student has given a complete order.

2. Now, each of you on your own should:

   a. Fill in the price for each item according to the menu. Your prices will depend upon how many people ordered each item.

   b. Subtotal the check.

   c. Determine the sales tax by multiplying the subtotal by 5 percent and rounding off to the nearest penny.

   d. Compute the total cost of the food check.

   e. Figure out what the tip would be by multiplying the subtotal by 15 percent. Normally the tip is computed without including the tax in the calculation.

   f. Compare your answers with those of the other members of your group and refigure those answers that differ (if any).

3. Your teacher will now combine two of the small groups in your class so that there are now four to six people in each group. Repeat steps 1 and 2.

4. If there is time, your teacher will now combine three small groups to form groups of six to nine people. Repeat steps 1 and 2.

5. Be prepared to discuss with your teacher and class what you think is important about writing and checking over a food check and why.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts for more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

MODULE 4, NUMBER 7 - CHECKING THE CHECK

Worksheet

MATHCO DELI*

#	ORDER	PRICE
	SUBTOTAL	
	TAX 5%	
	TOTAL	
	(TIP)	( )

MATHCO DELI*

#	ORDER	PRICE
	SUBTOTAL	
	TAX 5%	
	TOTAL	
	(TIP)	( )

MATHCO DELI*

MENU

APPETIZERS

FRUIT CUP	.70
JUICE (TOMATO, ORANGE, CRANAPPLE)	.35
SOUP (CLAM CHOWDER, VEGETABLE)	
CUP	.40
BOWL	.75
SHRIMP COCKTAIL	1.80

SALADS

TOSSED	.55
CAESAR	.85
HEARTS OF LETTUCE	.75

MAIN ORDERS

FROM THE GRILL

HAMBURGER	.95
CHEESEBURGER	1.15
HOT DOG	.75
CORN DOG	.85

SANDWICHES

GRILLED CHEESE	.85
TUNA SALAD	.80
TURKEY	.95
CHICKEN SALAD	.80
ROAST BEEF	1.55
HAM AND CHEESE	1.45
CORNED BEEF	1.30

SIDE ORDERS

FRENCH FRIES	.65
ONION RINGS	.70
POTATO CHIPS	.40

BEVERAGES

SOFT DRINKS (COLA, ROOT BEER, ORANGE)	.45
MILK	.50
COFFEE	.35
ICED TEA	.40

DESSERTS

BROWNIE	.50
ICE CREAM (VANILLA, CHOCOLATE, CHOCOLATE CHIP, ORANGE SHERBET)	.55
PUDDING	.50
PIE (APPLE, CHERRY)	.65
BROWNIE SUNDAE	1.50

MODULE 4, NUMBER 8 - TIME CARDS

Teacher Activity Sheet

Overview

Your students, through working with the MATHCO Time Card Game, will develop concepts of the relationship among hourly wages, hours worked, and weekly salary.

Math Skills Your Students Will Need

Addition of whole numbers and fractions, using money in multiplication, and working with time.

Time Allotment

One to two class periods.

Objectives

Your students will:

1. Reinforce their skills in dealing with time.
2. Reinforce their skills in working with fractions.
3. Learn the practical consequences of accuracy when working math problems.
4. Learn to follow new directions while playing the MATHCO Time Card Game.
5. Learn to cooperate while working in small groups.

Materials Your Class Will Need

Sixteen index cards for each pair of students, Time Cards Worksheets (which include Time Card Game instructions and MATHCOmpany time cards), and pencils.

Vocabulary

time card:	a card that is inserted into a special clock machine to record an employee's starting and quitting times each day
time in:	the time an employee reports to work
time out:	the time an employee leaves work for the day
wages:	the amount of money paid an employee for the time spent working

Self-Concept Builder

Your students will work together in small groups and help each other compute the correct answers. They will also use their imagination to decide what wages they will be paid per hour and will relate this amount to weekly wages for hours worked.

Activity

1. Discuss the use of time cards in business and industry with your students.
2. Divide your students into groups of two.*
3. Look over with your class the Time Cards Worksheets (which include the MATHCO Time Card Game instructions and MATHCOmpany time cards), and pass out sixteen index cards for each pair of students.
4. Review the instructions of the MATHCO Time Card Game with your students.
5. Your students will label their index cards.
6. Each pair of students will decide upon an hourly wage.
7. The students will now shuffle their cards and draw to see who will go first in each pair.
8. Proceed step by step with your students until you are sure that each pair understands the directions. Double-check to make sure they understand the significance of a.m. and p.m. in computing their hours worked.
9. Discuss with your class the results of the game and the importance of accuracy in computing their weekly wages.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

BUSINESS ACCOUNTANT

PAYROLL SUPERVISOR

EMPLOYEE IN ANY BUSINESS OR OFFICE THAT USES TIME CARDS

BUSINESS SCHOOL TEACHER

SUPERVISOR OF A DEPARTMENT IN AN OFFICE OR BUSINESS

GAME DEVELOPER

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*You may want to have the whole class participate in one game before proceeding with pairs.

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that men and women can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

Look in the want ads of your local newspaper. Find a job in which you would be interested and compute what the weekly and monthly wages would be if you got the job. If the yearly salary is given, how could you find out what your weekly and hourly wages would be? (Hint: Full-time employees usually work 40 hours a week.)

MODULE 4, NUMBER 8 - TIME CARDS

Student Activity Sheet

Your Name ______________________________ Date __________

Overview

In this activity, you will be working for the MATHCOmpany and figuring out what your weekly wages will be.

Math Skills You Need to Remember

Addition of whole numbers and fractions, working with time, and using money in multiplication.

Things You Will Need

Sixteen index cards for each pair of students, Time Cards Worksheet (which includes Time Card Game instructions and MATHCOmpany time cards), and a pencil.

Vocabulary

time card:	a card that is inserted into a special clock machine to record an employee's starting and quitting times each day
time in:	the time an employee reports to work
time out:	the time an employee leaves work for the day
wages:	the amount of money paid an employee for the time spent working

When You Finish You Will Be Able To

Figure out your imaginary weekly wages by multiplying the total hours you worked by your hourly wage.

Activity

1. With your teacher and class, discuss the use of time cards in business and industry.
2. Become familiar with the MATHCO Time Card Game instructions.
3. With your partner, using the Time Cards Worksheet, play the MATHCO Time Card Game.

4. Check over each other's answers and make any needed corrections in your calculations.
5. Be prepared to share the results of your game with your teacher and class. Why is accuracy important in figuring out weekly wages?

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both women and men enter each of the occupations you've listed above?

Exploring on Your Own

Look in the want ads of your local newspaper. Find a job in which you would be interested, and compute what the weekly and monthly wages would be if you got the job. If the yearly salary is given, how could you find out what your weekly and hourly wages would be? (Hint: Full-time employees usually work 40 hours a week.)

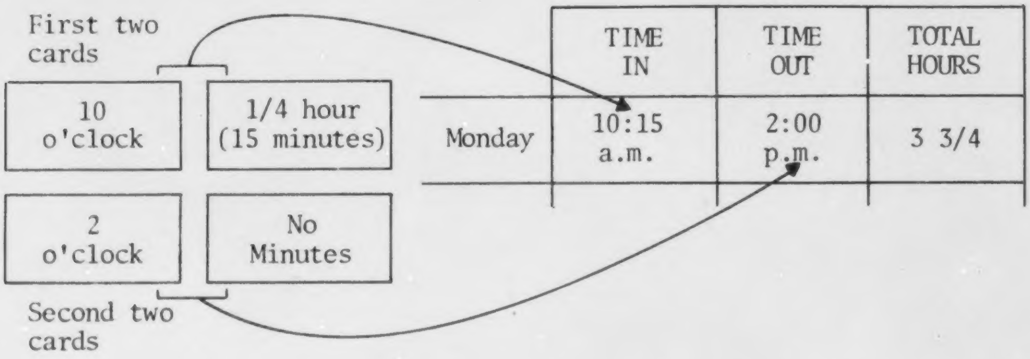
MODULE 4, NUMBER 8 - TIME CARDS

Worksheet

TIME CARD GAME INSTRUCTIONS

1. Using sixteen index cards for each pair of students, take twelve of the cards and number each with an hour, from 1 o'clock to 12 o'clock. The last four cards should be labeled: 1/4 hour (15 minutes), 1/2 hour (30 minutes), 3/4 hour (45 minutes), and No Minutes.
2. On the back of the first twelve cards, write Pile #1. On the back of the last four cards, write Pile #2.
3. Decide upon an hourly wage that you would like to be paid for doing a certain job. The wage must be the same for both players.
4. Shuffle each pile and place them face down. Each student picks a card from Pile #1. The person who picks the highest card will go first, keeping his or her card, while the other student reshuffles his or her card back into Pile #1.
5. The player going first now picks a card from Pile #2 and records the combined times for the two cards in the "Time In" column on the MATH-COmpany Time Card.

   The same player then picks again (without replacing the cards that have already been used) from each pile and records the new combined time in the "Time Out" column.



	TIME IN	TIME OUT	TOTAL HOURS
Monday	10:15 a.m.	2:00 p.m.	3 3/4

   This is an example of two "Time In" cards picked and two "Time Out" cards picked. Notice how they are recorded on the Time Card. You may choose whether the time is a.m. or p.m. for the "Time In" turn, but the "Time Out" must be the next time the hands pass that number on the clock.

6. The first player replaces the cards into the two piles and reshuffles. It is now the second player's turn to choose the cards.

7. This process is repeated until each player has filled in any five days on her or his Time Card.
8. Each player then totals up the hours worked that week and determines his or her weekly wages. The winner is the student who earns the most money that week.

MATHCOMPANY

NAME:

	TIME IN	TIME OUT	TOTAL HOURS
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			
SATURDAY			
SUNDAY			
TOTAL WEEKLY HOURS			

WAGES FOR THIS WEEK: ____________

MATHCOMPANY

NAME:

	TIME IN	TIME OUT	TOTAL HOURS
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			
SATURDAY			
SUNDAY			
TOTAL WEEKLY HOURS			

WAGES FOR THIS WEEK: ____________

Remember: Weekly Wages = Total Hours Worked times Hourly Wage.

MODULE 4, NUMBER 9 - RULES OF BOWLING

Teacher Activity Sheet

Overview

Your students will learn the rules of scoring a bowling game. For those students who have had experience in this area, this activity will serve as a review.

Math Skills Your Students Will Need

Addition and averaging.

Time Allotment

One to two class periods, depending on the popularity of bowling in your locale.

Objectives

Your students will:

1. Have their addition skills reinforced.
2. Learn the rules for scoring the game of bowling.
3. Gain practice in following directions.
4. Learn to average scores.
5. Be inspired to strive for accuracy.

Materials Your Class Will Need

Rules of Bowling Worksheets, graph paper, and pencils.

Vocabulary

average:	the number obtained by dividing the sum total of a set of figures by the number of figures
frame:	the individual scoring record of each turn you have when bowling; there are ten frames for each game of bowling
miss:	(-) none of the bowling pins is knocked down on a particular roll; this counts as zero (0) points

spare:	(/) all ten pins are knocked down with two rolls of the bowling ball; the score for that frame is the ten points for knocking down all ten pins (one point per pin), plus the number of pins you knock down on the first roll of your next turn
strike:	(X) all ten bowling pins are knocked down by the first ball rolled in a frame; the score for that frame is the ten points for knocking down all ten pins plus the total of your next two rolls

Self-Concept Builder

Many of your students have probably bowled before, or are at least familiar with the game. This activity will give them a chance to learn the rules of the game, to learn to keep score accurately, and possibly to become interested in learning how to bowl.

Activity

1. Go over with your students the information on the Rules of Bowling Worksheet that explains how to score the game.
2. Have your students do page two of the Worksheet, helping them only when they need it.
3. Ask your students to figure out on their Worksheets the average of the scores of the games represented by questions 5, 6, and 7. Remind them that they must add the scores for all three games and divide the total by the number of games played. Discuss those situations in which knowing one's average can be necessary and useful.
4. When they have finished their Worksheets, students may want to make their own string of frames using graph paper, and to make up imaginary game scores. Another option would be for all of your students to draw several strings of frames and for you to dictate the game rolls. Then the students can determine the scores of each game and find an average score as well. The class can then compare results, which will highlight the need for accuracy in computing bowling scores.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

ATHLETIC INSTRUCTOR

SPORTS COMMENTATOR

OWNER OR MANAGER OF BOWLING ALLEY

PROFESSIONAL BOWLER

SPORTS WRITER

MEMBER OF AN AMATEUR OR PROFESSIONAL BOWLING TEAM

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

Save your money and go bowling with your family or friends. Be the scorekeeper for the group, and figure out everybody's average. Good luck!

MODULE 4, NUMBER 9 - RULES OF BOWLING

Student Activity Sheet

Your Name ______________________________________ Date ____________

Overview

In this activity, you will learn the rules of the game of bowling, how to keep score accurately, and how to figure out bowling averages.

Math Skills You Need to Remember

Addition and averaging.

Things You Will Need

Rules of Bowling Worksheet, graph paper, and a pencil.

Vocabulary

average:	the number obtained by dividing the sum total of a set of figures by the number of figures
frame:	the individual scoring record of each turn you have when bowling; there are ten frames for each game of bowling
miss:	(-) none of the bowling pins is knocked down on a particular roll; this counts as zero (0) points
spare:	(/) all ten pins are knocked down using two rolls of the bowling ball; the score for that frame is the ten points for knocking down all ten pins (one point per pin), plus the number of pins you knock down on the first roll of your next turn
strike:	(X) all ten bowling pins are knocked down by the first ball rolled in a frame; the score for that frame is the ten points for knocking down all ten pins plus the total of your next two rolls

When You Finish You Will Be Able To

Understand the game of bowling better and know how to keep score and average accurately. You will be ready to play an actual bowling game with some of your classmates.

Activity

1. Read over and discuss with your teacher and class the information on page one of your Rules of Bowling Worksheet.
2. Make sure that you ask questions if something is not clear to you.
3. Complete page two of your Worksheet.
4. Figure out the average score for the bowler who bowled games 5, 6, and 7.

   That person's average is ______________.
5. On a piece of graph paper, draw some bowling frames. Your teacher will tell you when and how these frames are to be filled in. After they are filled in, compute the score for each game and figure out the average score for the bowler.

   The average score is ________________.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL
______________________________	________________________________
______________________________	________________________________
______________________________	________________________________
______________________________	________________________________
______________________________	________________________________
______________________________	________________________________

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

Save your money and go bowling with your family or friends. Be the scorekeeper for the group, and figure out everybody's average. Good luck!

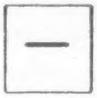
MODULE 4, NUMBER 9 - RULES OF BOWLING

Worksheet

The object in bowling is to knock down all ten pins at the end of your bowling alley by rolling a bowling ball down the alley. You are allowed two chances to knock down as many pins as possible each time it is your turn to bowl. The more pins you knock down, the higher will be your score. Each pin equals one point.

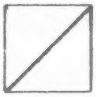
Scoring: To keep an accurate record of your game, each roll of the bowling ball is recorded on a scoring sheet. This sheet tells you your score at the end of each turn. There are ten frames per game.

MISS



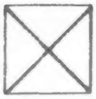
When none of the pins have been knocked down by the ball on a particular roll, you have a miss. It counts as zero (0) points.

SPARE

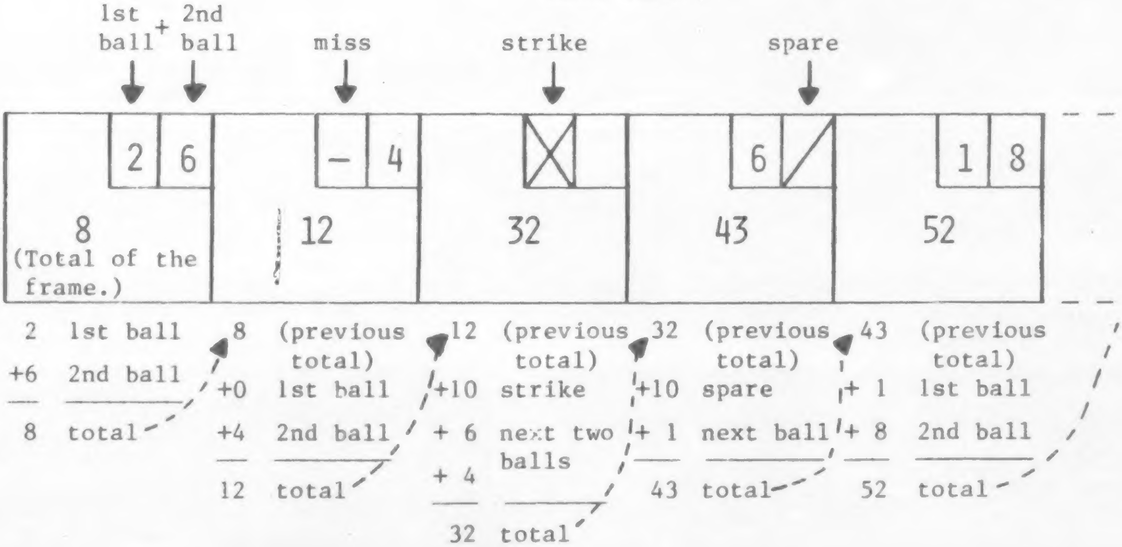


When all ten pins have been knocked down using two rolls of the bowling ball, you have a spare. The score for that frame counts ten points plus the first roll of your next turn. That first roll is counted again in the normal scoring of your next turn.

STRIKE



When all ten pins have been knocked down by the first ball, you have a strike. Your next two rolls are counted with the ten points of this roll to total your score for this frame. These two rolls are counted again in the normal scoring of your next turn.



2 1st ball
+6 2nd ball
8 total

8 (previous total)
+0 1st ball
+4 2nd ball
12 total

12 (previous total)
+10 strike
+ 6 next two balls
+ 4
32 total

32 (previous total)
+10 spare
+ 1 next ball
43 total

43 (previous total)
+ 1 1st ball
+ 8 2nd ball
52 total

Fill in the scores for the following bowling frames:

1.

2 3	- 1	4 4	- -	9 -
5	6	14	14	23

2.

3 6	4 /	2 4	- 9
9	21	27	36

3.

X	6 2	- 8
18	26	34

4.

7 2	X	6 /	7 2	9 /	- 9
9	29	46	55	65	74

This box is used for an extra roll if a spare or a strike is made in the last frame.

5.

4 /	2 6	X	7 /	2 5	X	3 6	9 -	5 /	7 1 ☐	TOTAL
12	20	40	52	59	78	87	96	113	121	121

6.

7 /	4 /	9 /	X	6 3	2 5	X	9 /	2 2	X 7 1	TOTAL
14	33	53	72	81	88	108	120	124	142	142

7.

X	9 /	6 2	6 -	X	X	X	8 /	7 /	9 / 7	TOTAL
20	36	44	50	80	108	128	145	164	181	181

This is a perfect bowling game. Remember to count the strike PLUS the next two balls!

8.

X	X	X	X	X	X	X	X	X	X X X	TOTAL
30	60	90	120	150	180	210	240	270	300	300

MODULE 4, NUMBER 10 - BOWLING

Teacher Activity Sheet

Overview

This activity should be preceded by Module 4, Number 9, Rules of Bowling. Your students will use the skills they have learned by having some mock bowling matches and recording the results.

Math Skills Your Students Will Need

Addition, averaging, and following directions.

Time Allotment

Two class periods.

Objectives

Your students will:

1. Have their addition skills reinforced.
2. Apply the rules of bowling that they have learned.
3. See the need for accuracy in scorekeeping.
4. Have practice in averaging scores.
5. Work in small groups.

Materials Your Class Will Need

Bowling Worksheets, eleven index cards per student, marking pens, pencils, and one shoe box or shallow container per group.

Self-Concept Builder

Your students will be playing a game based on luck and will simply record the results. Students will have an equal chance of winning, even if they are having difficulty in scoring their matches.

Activity

1. Hand out eleven index cards to each student. Using the marking pens, they are to label the cards as follows:

   One card: 0 pins, (-), miss

   One card: 10 pins, (X), strike

   The other nine cards: 1 pin, 2 pins, 3 pins, ...9 pins

2. Refer the students to the Bowling Worksheets and divide your class into groups of twos or threes. Have each student in the group put her or his index cards into the group's container and shuffle them. If there are three players, there should be 33 cards in the box.

3. Rules:

   a. Each student picks a card to determine who in the group bowls first. The highest card goes first, etc. In case of a tie, those students tied should draw again to see who goes first.

   b. Students bowl by picking cards. Two cards may be drawn for each frame. If the second card is too high (the first and second card total may not be higher than ten), that player should draw again until an appropriate card is chosen. That player then replaces and shuffles the cards and the next player takes a turn.

   c. Remind your students that if a player gets a spare or a strike, he or she must wait until his or her next turn to total that frame. Only two cards may be picked per turn, except in the last frame if a strike or a spare has been picked.

4. Have your students play several matches and average their scores. Who in your class had the highest average? Who had the highest single-game score? Which group had the highest combined average?

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

GAME DEVELOPER

PROFESSIONAL BOWLER

SPORTS WRITER

MEMBER OF AMATEUR OR PROFESSIONAL BOWLING TEAM

ATHLETIC INSTRUCTOR

SPORTS COMMENTATOR

OWNER OR MANAGER OF BOWLING ALLEY

PUBLISHER OF GAMES

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

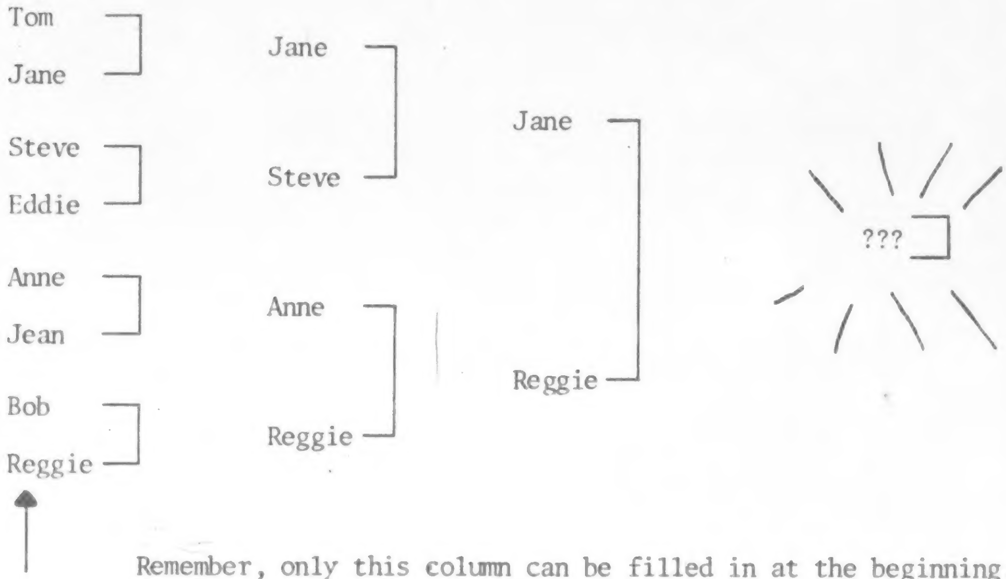
Stress that men and women can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

You and some of your classmates might want to organize a bowling tournament for your class. Start by pairing up all of your classmates and make a tournament wall chart. The winner of each match must win two out of three games to go on to the finals. After all matches have been played, your class will have a bowling superstar.

Your chart should look something like this:



Remember, only this column can be filled in at the beginning. The rest of the names will be filled in as the matches are played and the winners determined.

MODULE 4, NUMBER 10 - BOWLING

Student Activity Sheet

Your Name ________________________________ Date ______________

Overview

In this activity, you will be using the rules you learned for playing and scoring the game of bowling as you play the MATHCO Bowling Game.

Math Skills You Need to Remember

Addition, averaging, and following directions.

Things You Will Need

Bowling Worksheet, eleven index cards, a marking pen, a pencil, and one shoe box or shallow container for your group.

When You Finish You Will Be Able To

Understand how the game of bowling works and know how to score the game, as well as figure out your bowling average.

Activity

1. Your teacher will give you eleven index cards. Using a marking pen, label them as follows:

0 pins (-) miss	1 pin	2 pins	3 pins	4 pins	5 pins
6 pins	7 pins	8 pins	9 pins	10 pins (X) strike	

2. After your teacher puts you into a group with one or two other students, put your names on your scoring sheet. Each of you should put your index cards into your group's shoe box or container and someone should shuffle them. If there are three students in your group, there should be 33 cards in the box.

3. Rules:
    a. Each person in your group should pick a card to see who goes first. The person picking the second-highest card goes second, etc. In case of a tie, tied players should choose another card.
    b. Students bowl by picking cards. Two cards may be drawn for each frame. If the second card is too high (the two cards may not total more than ten), that player should draw again until an appropriate card is chosen. After each person's turn, the cards he or she picked should be shuffled back into the box.
    c. If a player bowls a strike or a spare, he or she must wait until the next turn to total that frame. Only two cards may be picked per turn, except in the last frame if a strike or a spare has been bowled.
4. Play several matches and average your individual scores.

    ____

5. Who in your class had the highest average? ______________

6. Who had the highest single-game score? ______________

7. What was the average of your group? ______________

8. Which group had the highest combined average? ______________

    ____

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL
______________	______________
______________	______________
______________	______________
______________	______________
______________	______________
______________	______________

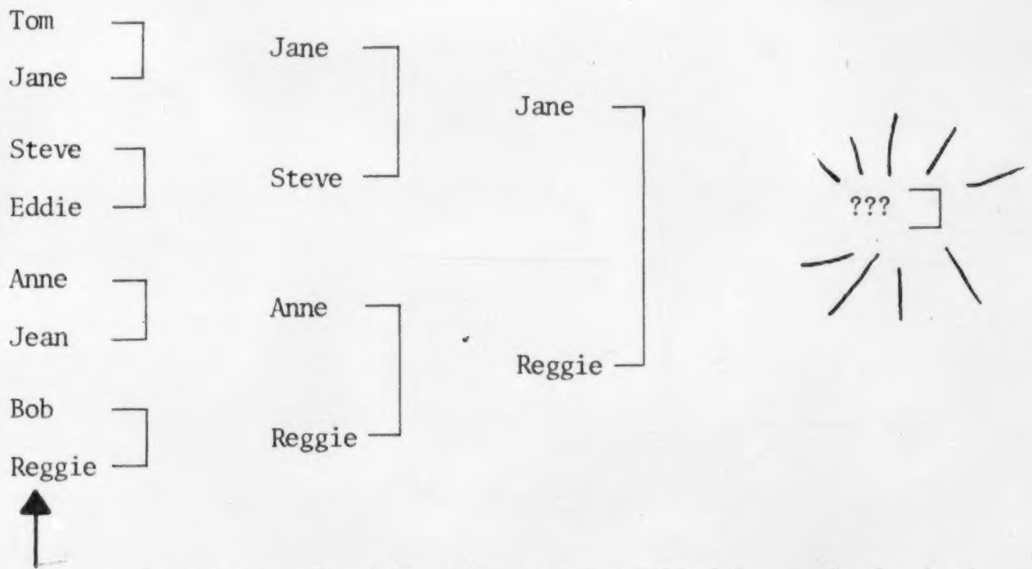
Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

You and some of your classmates might want to organize a bowling tournament for your class. Start by pairing up all of your classmates and making a tournament wall chart. The winner of each match must win two out of three games to go on to the finals. After all matches have been played, your class will have a bowling superstar.

Your chart should look something like this:



Remember, only this column can be filled in at the beginning. The rest of the names will be filled in as the matches are played and the winners determined.

BOWLING SCORE SHEET

Name

										TOTAL

Name

										TOTAL

Name

										TOTAL

Name

										TOTAL

Name

										TOTAL

Name

										TOTAL

MODULE 4, NUMBER 11 - PYRAMID POWER

Teacher Activity Sheet

Overview

Your students will construct a pyramid out of cardboard and conduct an experiment to see if it has any "mystical" effect on plant growth.

Math Skills Your Students Will Need

Measuring, determining surface area, and graphing.

Time Allotment

One to two class periods and homework, plus short daily follow-ups for two, three, or more weeks.

Objectives

Your students will:

1. Construct a pyramid.
2. Conduct an experiment.
3. Practice accuracy in measuring.
4. Make daily observations.
5. Graph the growth of the plants used in the experiment.

Materials Your Class Will Need

Pyramid Power Information Sheets and Worksheets, cardboard (stiff enough not to warp), tape, directional compass, graph paper, string, paper, pencils, paper cups, potting soil, two seedlings of the same kind of plant and approximately the same size for each individual or group constructing a pyramid, water, and a light source.

Vocabulary

experimental group:	a group of things or people exposed to certain conditions to see what effect, if any, these special conditions have on them

control group:	a group of similar things or people not exposed to special conditions; this group is kept under normal conditions and can be compared with the experimental group
mummified:	a word used to describe a dead body that has remained remarkably well preserved due to special treatment or special conditions

Self-Concept Builder

Your students will be working in small groups to construct their pyramids. As the experiment progresses, they will share the results with each other.

Activity

1. The day before you begin construction of the pyramids, review the Pyramid Power Information Sheet with your students. Ask them to do some research on their own concerning the "mystical" power of pyramids and to share their findings with the class.

   Many people believe that pyramids produce strange reactions from certain animate and inanimate things. Discuss these beliefs with your class and listen to their varying reactions.
2. Divide your class into small groups of three or four students each.
3. Your students will conduct the Pyramid Power experiment (see Pyramid Power Worksheet).

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

RESEARCH TECHNICIAN

SCIENTIST

HORTICULTURIST

DOCTOR

BIOLOGIST

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

1. Try another experiment at home. Make "pyramid water" to water certain plants. Keep tap water under a pyramid for one week. Then mix it with an equal amount of fresh tap water. Water your experimental plants using this special water, and your control group plants using regular tap water only. Record the growth of your plants on a graph.
2. Can you think of another pyramid experiment that perhaps has never been tried? Try it and see what happens.

MODULE 4, NUMBER 11 - PYRAMID POWER

Student Activity Sheet

Your Name ______________________________ Date ____________

Overview

In this activity, you will conduct an experiment to determine if the special pyramid shape has any power to affect plant growth.

Math Skills You Need to Remember

Measuring, determining surface area, and graphing.

Things You Will Need

Pyramid Power Information Sheet and Worksheet, cardboard (stiff enough not to warp), tape, directional compass, graph paper, string, paper, pencil, paper cups, potting soil, two seedlings of the same kind of plant and approximately the same size, water, and a light source.

Vocabulary

experimental group:	a group of things or people exposed to certain conditions to see what effect, if any, these special conditions have on them
control group:	a group of similar things or people not exposed to special conditions; this group is kept under normal conditions and can be compared with the experimental group
mummified:	a word used to describe a dead body that has remained remarkably well preserved due to special treatment or special conditions

When You Finish You Will Be Able To

Decide whether or not the pyramid you constructed really had an effect on the growth of your plant.

Activity

1. Read the Pyramid Power Information Sheet. Do some research on your own to see if you can find some additional information that you can share with your class about the "mystical" power of pyramids.
2. Your teacher will divide the class into small groups of three or four students each.
3. Using your Pyramid Power Worksheet, conduct the experiment that it describes.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts for more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

1. Try another experiment at home. Make "pyramid water" to water certain plants. Keep tap water under a pyramid for one week. Then mix it with an equal amount of fresh tap water. Water your experimental plants using this special water, and your control group plants using regular tap water only. Record the growth of your plants on a graph.
2. Can you think of another pyramid experiment that perhaps has never been tried? Try it and see what happens.

MODULE 4, NUMBER 11 - PYRAMID POWER

Information Sheet

Several decades ago, a Frenchman named Bovis visited the Great Pyramid at Giza, Egypt. While he was in the section of the pyramid called the King's Chamber, he noticed that a dead cat that had been placed in a trash can had mummified. He wondered if the shape of the pyramid had anything to do with this strange event. Had he discovered the ancient secret of the Egyptians?

Bovis then performed an experiment. He built a much smaller version of the Great Pyramid and placed a dead cat in it. He positioned the cat similarly to the one he had seen in the King's Chamber of the Great Pyramid. In time, this cat also mummified.

Word of this experiment spread quickly. Soon all of Europe was making and using pyramids. Some people put containers of milk under pyramids to slow down spoilage; others kept yogurt under them; still other people claimed that their razor blades remained sharp if kept under a pyramid. Even today, in some parts of the world, you can find pyramids for sale.

The power of the pyramid seems to be related to its shape, its proportions, and how it is aligned with the earth's magnetic field. The sides of a pyramid slope up from its base at an angle of 51°51'. The pyramid should be set up so that one of its sides faces magnetic north. Of course, its other sides then face south, east, and west.

Many tests involving pyramid power have been conducted over the years, including one at Central State University in Oklahoma. A scientist grew several groups of plants, some in a pyramid container, some in a prism container, some in a rectangular container, and a fourth group--the control group--was left alone to grow under normal conditions. The pyramid plants grew a combined total of 89 inches, while the control group grew only 62 inches.

Cut flowers have been placed under a pyramid. In this case, scientists found that the flowers dried up, but retained their color and fragrance. Pyramids have also been used to heal sick plants. Some people say that when they place a pyramid under their chairs or beds, and sit or lie over it, they seem to have more energy. Others claim that sitting under a pyramid makes them feel very calm.

Not all scientists feel that pyramids have a special power, however. As a matter of fact, many experiments have seemed to prove that there is no truth to the belief whatsoever.

You will have to draw your own conclusions after conducting your pyramid experiment. One caution as you try the pyramid power experiment: if your plants start getting withered or sickly under the pyramid, remove them and allow them to grow under normal conditions again. Sometimes pyramid power can be too much for certain plants!

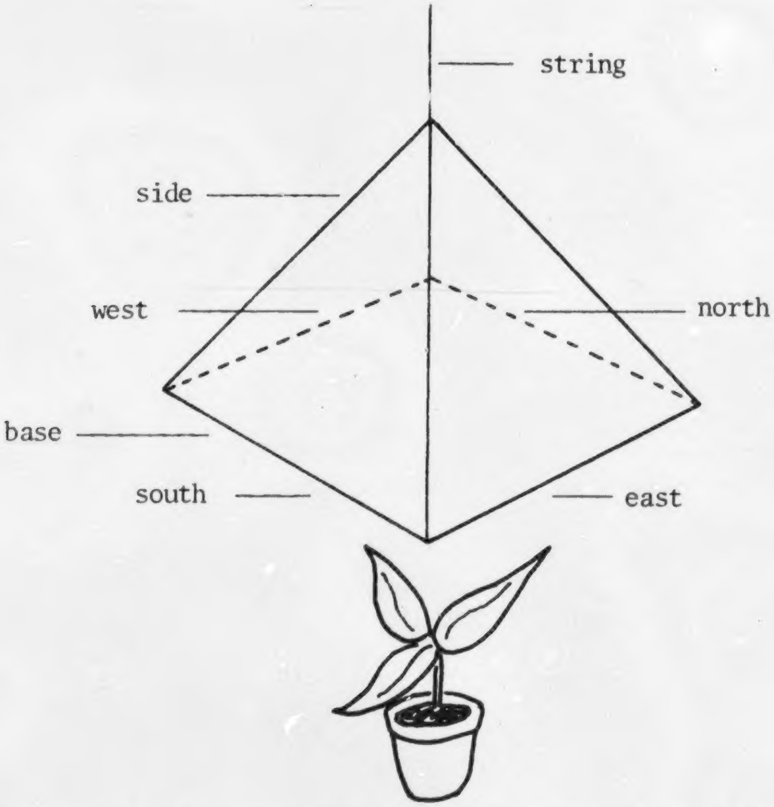
MODULE 4, NUMBER 11 - PYRAMID POWER

Worksheet

PYRAMID POWER EXPERIMENT

1. Using relatively stiff cardboard that is not likely to warp, follow the directions below to construct the pyramid that your group chooses.

HEIGHT	BASE	SIDE
6"	9 3/8"	8 7/8"
10"	15 3/4"	15"
12"	18 3/4"	17 3/4"



2. The height/base/side chart above gives the dimensions for pyramids of three different sizes. Choose one set of measurements, draw the triangular shapes on your cardboard with a ruler, then carefully cut out each of the four sides of the pyramid from the cardboard. Measure and cut carefully, for inaccurate drawing or cutting may affect the experiment. Tape the sides of your pyramid together.

3. Determine the surface area of your pyramid. ______________________

4. These pyramids are to be hung over the plants at a level of 4 to 6 inches above a plant that is 2 to 3 inches in height. For larger plants, the pyramid should be suspended at least 10 to 12 inches above the top leaves. Decide where the pyramid will hang and how much string will be necessary to suspend it properly. Insert one end of the string through the top of the pyramid and secure it with tape so that the pyramid will hang straight.

5. Using prepotted seedlings or those that you have planted in paper cups, place one seedling under the hanging pyramid and another close to it, but not actually under the cardboard.

6. Make sure the pyramid over the experimental plant is at the proper height and make sure one side of the pyramid is facing due north. Use a compass to be accurate.

7. The two plants must have the same amounts of water and light in order for you to compare the results accurately. Check to make sure that lighting conditions are identical, and measure your water carefully.

8. Each day, measure the amount of growth of the experimental plant. Graph this information with a colored pencil on paper using a line graph. On the same graph, record the growth of your control plant by using a pencil of a different color. On the back of your graph paper, date and record any unusual observations you make during the time of the experiment.

9. Determine an ending date for this experiment (two or three or more weeks). On the last day, write a paragraph explaining the results of the experiment and telling whether or not you feel the pyramid has had any effect on the growth of the plant underneath it. Staple your paragraph to your graph and hand it in to your teacher. Be prepared to discuss your results with the rest of your class.

MODULE 4, NUMBER 12 - BUILDING A DOGHOUSE

Teacher Activity Sheet

Overview

Your students will learn how to plan the construction of a doghouse.

Math Skills Your Students Will Need

Making a scale drawing, knowledge of the Pythagorean theorem, estimating cost, and determining surface area and volume.

Time Allotment

Two class periods.

Objectives

Your students will:

1. Create and sketch a doghouse.
2. Learn how to visualize measurement.
3. Make a scale drawing from a sketch.
4. Determine the best pattern layout to conserve material.
5. Calculate the surface area of the wood to be used.
6. Estimate costs.
7. Work individually or in a small group.

Materials Your Class Will Need

Graph paper, information from a local lumberyard or building supply company, rulers, and pencils.

Vocabulary

pitch:	the slope of something
plywood:	a building material that is composed of many thin sheets of wood that are glued or cemented together
Pythagorean theorem:	the theorem that states that the sum of the squares of the lengths of the sides of a right triangle equals the square of the length of the hypotenuse

scale drawing:	a relatively small drawing of a larger object or a large drawing of a smaller object that keeps the same ratio of measurements
surface area:	the amount of space within a given set of lines
volume:	the amount of a substance; the bulk or mass

Self-Concept Builder

Students will use their imagination in planning their doghouses. They will gain experience in cooperating within a small group and will learn some practical skills that they may use at home.

Activity

1. Divide students into groups of three to five.
2. Allow these groups to discuss and decide upon the size and design of their doghouse. Each group should draw a simple sketch of what they have in mind.
3. Assign one of your students to call a local lumberyard or building supply company and find the prices of plywood and what size sheets it comes in. This person should also ask the store personnel if they can cut the plywood for the purchaser, and if so, how much this will cost.
4. Assign another student to call a local hardware store to find out the cost of outdoor paint, nails, and roofing supplies. This person should find out how much surface area a gallon of paint will cover.
5. Review with your class, to whatever extent you feel is necessary, the concept of a scale drawing. Also review the Pythagorean theorem.
6. Hand out graph paper, and have each student draw, to scale, both the front and the sides of their group's doghouse. Make sure they label their measurements on the graph paper.
7. Have the students who were assigned to research sizes and prices report on their findings. Each group should copy down these figures, as they will use them in the steps that follow.
8. Have the students use their scale drawings to determine how much plywood will actually be needed to build the doghouse. Students will have to determine the surface area of their doghouses. Most of the measurements will simply be the areas of rectangles, except for the front and back, which reflect the pitch of the roof. The Pythagorean theorem comes into play as they try to determine the slope. Remind them, if they haven't thought of it, that their doghouses need floors.

9. Hand out a second sheet of graph paper to each student and ask them to draw to scale the pieces of plywood they need to complete their doghouses. Then have them lay out the pattern pieces in the most efficient way possible--as if they intend to cut the plywood. They should label each piece and make sure they are using the least amount of plywood possible.
10. Using the above information, each group should determine the cost of the plywood needed for its doghouse and should estimate how much the entire doghouse will cost, including nails, paint, roofing materials, and any other "extras" that the group has decided it needs.

Occupations Related to This Activity

What occupations might use an activity similar to this? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

CARPENTER

ARCHITECT

CONSTRUCTION CREW AND SUPERVISOR

INTERIOR DECORATOR

ANYONE WHO WANTS TO BUILD SOMETHING ON HER OR HIS OWN

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

If you have a pet at home and can get your parents' permission, you might plan and construct a house for your pet using plywood or cardboard. As you do the construction, see how accurate your planning calculations were. You might want to share your experiences with your class.

MODULE 4, NUMBER 12 - BUILDING A DOGHOUSE

Student Activity Sheet

Your Name ____ Date ______________

Overview

In this activity, you will learn the necessary steps to follow in planning the construction of a doghouse.

Math Skills You Need to Remember

Making a scale drawing, knowledge of the Pythagorean theorem, estimating cost, and determining surface area and volume.

Things You Will Need

Graph paper, information from a local lumberyard or building supply company, a ruler, and a pencil.

Vocabulary

pitch:	the slope of something
plywood:	a building material that is composed of many thin sheets of wood that are glued or cemented together
Pythagorean theorem:	the theorem that states that the sum of the squares of the lengths of the sides of a right triangle equals the square of the length of the hypotenuse Note: Your teacher will discuss this theorem with you when you are ready to begin your activity.
scale drawing:	a relatively small drawing of a larger object or a large drawing of a smaller object that keeps the same ratio of measurements
surface area:	the amount of space within a given set of lines
volume:	the amount of a substance; the bulk or mass

When You Finish You Will Be Able To

Plan how to build a doghouse, determine the costs of building it, and know the most economical way to cut plywood.

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Activity

1. With your small group, think about the design and the size of the doghouse you would like to build (shape, height, width, depth).
2. Make a sketch of the doghouse you have in mind.
3. Discuss with your teacher and class the meaning and uses of a scale drawing. Your teacher may also review the Pythagorean theorem at this time.
4. On a piece of graph paper, draw the front and side views of the doghouse to scale. Make sure to indicate on your graph paper what scale you are using, for example, 1/4" = 6".
5. Copy down the information that some of your classmates will report on the sizes and prices of building materials.
6. Using your drawing with all measurements labeled, determine how much plywood will be needed to build the doghouse. You will need to figure the surface area of all the rectangles of your doghouse. The Pythagorean theorem will allow you to figure those areas that include the pitch of the roof. Remember to include a floor for your doghouse.

   The surface area of your doghouse is ______________________________

7. On another piece of graph paper, draw to scale the pieces of plywood as they will look when you buy them from a store. Show how you would lay out the pattern pieces of your doghouse in such a way as not to waste any wood.
8. How much will the wood for your doghouse cost? ________________
9. Estimate the cost of constructing the doghouse, including the cost of the plywood, nails, roofing materials, etc.

   The cost would be approximately ____________________________________

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

If you have a pet at home and can get your parents' permission, you might plan and construct a house for your pet using plywood or cardboard. As you do the construction, see how accurate your planning calculations were. You might want to share your experiences with your class.

MODULE 4, NUMBER 13 - SURFACE AREA (COST OF PAINT AND WALLPAPER FOR A ROOM)

Teacher Activity Sheet

Overview

This useful activity will help your students understand the process of determining how much paint and/or wallpaper is necessary to redo the walls and ceiling of a room.

Math Skills Your Students Will Need

Computing surface area, subtraction, addition, and estimating costs.

Time Allotment

Two class periods.

Objectives

Your students will:

1. Reinforce their skills in measuring.
2. Reinforce their skills in determining surface area.
3. Use information obtained from local stores to estimate the amounts and costs of needed materials.
4. Systematically plan how to paint and wallpaper a room.
5. Draw the walls and ceiling of your classroom to scale.
6. Work together in small groups.

Materials Your Class Will Need

Graph paper, Surface Area Worksheets, pencils, and rulers.

Self-Concept Builder

Students will be working in small groups and can help each other answer the questions on the Worksheets.

Activity

1. Students will work in small groups. Have them measure the surface area of your classroom ceiling and walls. They will use this information to determine how much paint would be needed to put two coats on the ceiling and wall areas. They will also be determining how much wallpaper would be necessary to paper the walls of the room.
2. Have several of your students call paint and wallpaper supply stores to ask the prices of paint, find out what area a gallon is expected to cover, and inquire if the store has any suggestions for determining how much paint is needed. They should also ask for the average cost of wallpaper, find out what area each roll of wallpaper covers, and ask if there are any suggestions for determining how much paper would be needed to cover a particular room.
3. With pencil, ruler, and graph paper in hand, each student should use her or his group's surface area calculations to draw to scale all the walls of your classroom, including windows and doors. The ceiling should also be drawn to scale. All dimensions should be labeled on the graph paper.
4. The students who called for information will share their findings with the class. Put all information on the chalkboard.
5. Your students are now ready to complete their Surface Area Worksheets.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

PAINTER

ARCHITECT

ANYONE WANTING TO PAINT OR WALLPAPER
A ROOM OR HOUSE

WALLPAPER HANGER

CONSTRUCTION MANAGER

INTERIOR DECORATOR

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that men and women can be equally successful in most careers, if they are qualified.

MODULE 4, NUMBER 13 - SURFACE AREA (COST OF PAINT AND WALLPAPER FOR A ROOM)

Student Activity Sheet

Your Name ________________________________ Date ______________

Overview

In this activity, you will determine how much paint and/or wallpaper is necessary to redo the walls and ceiling of your classroom.

Math Skills You Need to Remember

Computing surface area, subtraction, addition, and estimating costs.

Things You Will Need

Graph paper, Surface Area Worksheet, a pencil, and a ruler.

When You Finish You Will Be Able To

Determine the amount of paint and wallpaper needed to redo a room.

Activity

1. With your group, measure the walls and ceiling of your classroom to determine their surface area.
2. Several students from your class will be phoning paint and wallpaper supply stores in your neighborhood to find out prices of paint and wallpaper, how much surface area a gallon of paint or a roll of wallpaper will cover, and if the store has any suggestions as to how much paint and wallpaper will be necessary to cover your classroom. These students will share their information with you and your group.
3. Use your pencil, ruler, and graph paper to draw to scale all the walls of your classroom, including the windows and doors. Also, draw to scale the ceiling of your classroom. Make sure you label all dimensions on your graph paper.
4. Use all of the information that you and your classmates have gathered to complete your Surface Area Worksheet.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both women and men enter each of the occupations you've listed above?

MODULE 4, NUMBER 13 - SURFACE AREA (COST OF PAINT AND WALLPAPER FOR A ROOM)

Worksheet

1. With your small group, measure the length of the walls of your classroom. Take notice of where each door or window begins and ends. Measure the height of the walls. Use the back of this page to record your findings.

2. On a piece of graph paper, draw to scale a sketch of each wall in your classroom. Label the dimensions of each wall, including doors and windows.

3. Find the surface area of the ceiling in your classroom. ________________________

4. Find the surface area of the walls in your classroom without subtracting the measurements of the windows and doors. ________________________

5. What is the surface area of the walls when the measurements of the windows and doors are subtracted? ________________________

6. Using the information obtained from local paint and wallpaper stores, determine how many gallons of paint it will take to cover the ceiling area and the wall area with two coats of paint. ________________________

7. How much will it cost to use a medium-priced paint? ________________________

8. How many rolls of wallpaper with no repeating design will it take to cover the walls in your classroom, not including the doors and windows? ________________________

9. How much will it cost to wallpaper the room using a medium-priced wallpaper? ________________________

MODULE 4, NUMBER 14 - CALLING LONG-DISTANCE

Teacher Activity Sheet

Overview

Your students will gain experience in determining the cost of a long-distance telephone call and will discover the best and least expensive times to call long-distance.

Math Skills Your Students Will Need

Multiplication using money, reading and interpreting charts, and figuring percents.

Time Allotment

One class period and perhaps homework.

Objectives

Your students will:

1. Learn to read and interpret a chart that describes various telephone long-distance rates.
2. Use comparisons to determine the best buy.
3. Use percent to make comparisons.
4. Reinforce skills in multiplying and using decimals.

Materials Your Class Will Need

A telephone directory listing the long-distance rates to several cities (one directory for every three students or a page duplicated for each student), Calling Long-distance Worksheets, and pencils.

Vocabulary

direct distance dialing: the person making a long-distance phone call has all the necessary information and completes the call without needing the operator's help

operator-assisted phone call:	the operator dials the number for the person making a phone call or assists him or her in some way
budget:	a plan for controlling your money wisely; this plan is determined by the relationship between the amount of money you have (or make) and what you must spend it on

Self-Concept Builder

Students will select the destinations of the long-distance phone calls whose cost they will compute. Thus, this activity offers a twofold self-concept builder: an opportunity to exercise freedom of choice and an enhancement of decision-making skills.

Activity

1. Using the front section of the local telephone directory, each student selects the city she or he wishes to call. You may wish to duplicate a copy of the appropriate long-distance page(s) for each student or arrange for your local telephone company to lend you 20 or 30 telephone directories.
2. Students should complete the Calling Long-distance Worksheets. A review of how percentages can be used to make comparisons may be in order.
3. Note: If your class is interested, you might call your local telephone company business office to arrange for a tour of their facilities for your class. The company may be willing to arrange for a telephone representative to come to your class to talk about opportunities in the company and to explain some of its new technological advances of recent years.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

SECRETARY

ACCOUNTANT

OFFICE BUDGET ADMINISTRATOR

TELEPHONE OPERATOR

SALESPERSON

TELEPHONE COMPANY BILLING CLERK

ANY PERSON WHO REGULARLY MAKES LONG-DISTANCE TELEPHONE CALLS

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

Ask your parents or someone at home which cities they most often call long-distance. Figure out the best and least expensive times for them to place their calls.

MODULE 4, NUMBER 14 - CALLING LONG-DISTANCE

Student Activity Sheet

Your Name ______________________________ Date ____________

Overview

In this activity, you will discover how to determine the costs of a long-distance telephone call and find the best and least expensive times to call long-distance.

Math Skills You Need to Remember

Multiplication using money, reading and interpreting charts, and figuring percents.

Things You Will Need

Some information from a local telephone directory, Calling Long-distance Worksheet, and a pencil.

Vocabulary

direct distance dialing:	the person making a long-distance phone call has all the necessary information and completes the call without needing the operator's help
operator-assisted phone call:	the operator dials the number for the person making a phone call or assists him or her in some way
budget:	a plan for controlling your money wisely; this plan is determined by the relationship between the amount of money you have (or make) and what you must spend it on

When You Finish You Will Be Able To

Understand how long-distance telephone call rates are determined and know the best times to place a long-distance telephone call.

Activity

1. Use the information from a local telephone directory provided by your teacher to choose one of the cities listed that you would like to call.
2. Complete your Calling Long-distance Worksheet. Be sure to ask for assistance if you have a question.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both women and men enter each of the occupations you've listed above?

Exploring on Your Own

Ask your parents or someone at home which cities they most often call long-distance. Figure out the best and least expensive times for them to place their calls.

MODULE 4, NUMBER 14 - CALLING LONG-DISTANCE

Worksheet

Using the page(s) in a local telephone directory that list the long-distance rates, choose one of the cities listed to which you would like to place a long-distance telephone call.

Compute the following information for a 15-minute long-distance telephone call to the city you have selected:

1. How much will it cost to call the city of ____________________ and talk for 15 minutes

	DIRECT	OPERATOR-ASSISTED	DIFFERENCE
-- on a weekday between 8 a.m. and 5 p.m.?			
-- on a weekday in the evening between 5 p.m. and 11 p.m.?			
-- at night after 11 p.m. and on the weekend?			

2. What percent less expensive is it to dial direct rather than have the operator assist you

-- on a weekday between 8 a.m. and 5 p.m.? ____________________

-- on a weekday in the evening between 5 p.m. and 11 p.m.? ____________________

-- at night after 11 p.m. and on the weekend? ____________________

3. Pick another city and calculate the same kind of information that you obtained above.

   How much will it cost to call the city of ________________ and talk for 15 minutes

	DIRECT	OPERATOR-ASSISTED	DIFFERENCE
-- on a weekday between 8 a.m. and 5 p.m.?			
-- on a weekday in the evening between 5 p.m. and 11 p.m.?			
-- at night after 11 p.m. and on the weekend?			

4. Using your information from Problem 3, what percent less expensive is it to dial direct rather than have the operator assist you

   -- on a weekday between 8 a.m. and 5 p.m.? ________________

   -- on a weekday in the evening between 5 p.m. and 11 p.m.? ________________

   -- at night after 11 p.m. and on the weekend? ________________

5. Why is it less expensive to call in the evening than it is to call during the day?

   The phone company is far less busy after the working day is over.

   Rates are cheaper to encourage people to call then.

6. Why is it less expensive to call on the weekend than it is to call during the week?

   The weekend is the phone company's slack period and the cheaper rates encourage people to call on the weekend.

7. If your budget allowed you $5.00 to spend on a long-distance phone call, how long could you talk to the city of your choice without spending more than your $5.00?

   CITY ________________ MINUTES ________________ COST ________________

8. Why does the telephone company give such a large discount to people who dial direct rather than using the operator to assist them?

It costs the phone company far less to process the direct call.

They want to encourage people to help themselves.

9. Find out more about your telephone directory. What other information does it list for you?

Emergency numbers; area codes for states and selected cities; area code map; helpful telephone tips; how to connect or disconnect your phone; etc. (Answers will vary.)

MODULE 4, NUMBER 15 - AUTO MATH

Teacher Activity Sheet

Overview

In this activity, your students will learn how to calculate miles per gallon by keeping a record of a car's mileage and the amount of gas used at each fill-up.

Math Skills Your Students Will Need

Addition, subtraction, multiplication, division, working with decimals, rounding off numbers, estimating, and understanding fractions.

Time Allotment

Two class periods (although some students may need to finish the assignment at home).

Objectives

Your students will:

1. Follow directions.
2. Estimate fractions.
3. Complete charts.
4. Read an odometer.
5. Compute miles per gallon (mpg).
6. Add, subtract, and divide using decimals.
7. Work in small groups as they check over their work.

Materials Your Class Will Need

Auto Math Worksheets and pencils.

Vocabulary

miles per gallon (mpg):	the average number of miles that a car has traveled using one gallon of gas
odometer:	the instrument on the dashboard of a car or other vehicle that indicates the total number of miles the car or vehicle has traveled

Self-Concept Builder

Many students are interested in cars at this age and will find this practical application of math most informative. Working in small groups will help minimize the pressure of finding the correct answers alone.

Activity

1. Read through the Auto Math Worksheet directions with your students. Use one class period to go over the first two pages of the Worksheet with your class.
2. On the second day, your students are to complete the remaining two pages of the Worksheet on their own, but they should be grouped in pairs to help each other with problem areas.
3. While your students are working, check to make sure they all understand the various parts of the Worksheet.

Occupations Related to This Activity

What occupations might use an activity similar to this one? Have your students complete the career section on their Activity Sheets. After class discussion, they should add these occupations to the list:

TAXI DRIVER

AUTO MECHANIC

TRAFFIC MANAGER OF A TRANSPORTATION COMPANY

BUS DRIVER

PILOT

TRUCK DRIVER

Discuss the kinds of courses people going into these occupations should take in high school. Have your students add these courses to their Activity Sheets.

Stress that women and men can be equally successful in most careers, if they are qualified.

Suggested Independent Activities

(These suggestions appear on Student Activity Sheets.)

Try to determine how many miles per gallon your family's or a friend's car is averaging. Keep a record of the odometer readings and number of gallons of gas used at each fill-up or partial fill-up. Compute the mpg for that car. The car's owner will probably thank you very much.

MODULE 4, NUMBER 15 - AUTO MATH

Student Activity Sheet

Your Name ______________________________ Date ______________

Overview

In this activity, you will learn how to determine the miles per gallon that a car is averaging.

Math Skills You Need to Remember

Addition, subtraction, multiplication, division, working with decimals, rounding off numbers, estimating, and understanding fractions.

Things You Will Need

Auto Math Worksheet and a pencil.

Vocabulary

miles per gallon (mpg):	the average number of miles that a car has traveled using one gallon of gas
odometer:	the instrument on the dashboard of a car or other vehicle that indicates the total number of miles the car or vehicle has traveled

When You Finish You Will Be Able To

Determine how many miles per gallon a car or other vehicle is averaging and know how to figure out how far you can travel on a full tank of gas if your gas gauge happens to be broken.

Activity

1. Read over and complete your Auto Math Worksheet. Be sure to ask your teacher for help if you get confused.
2. When you have finished, get together with the partner your teacher has assigned you to compare answers and rework any answers that appear to be wrong.

Occupations Related to This Activity

(You may check the MATHCO Career Wall Charts to get more information about a career in which you are interested.)

OCCUPATIONS	SUBJECTS NEEDED IN HIGH SCHOOL

Are you interested in any of these careers? Remember, you can be anything you want to be--if you are qualified.

Women and men can do the same jobs with equal success. Can't both men and women enter each of the occupations you've listed above?

Exploring on Your Own

Try to determine how many miles per gallon your family's or a friend's car is averaging. Keep a record of the odometer readings and number of gallons of gas used at each fill-up or partial fill-up. Compute the mpg for that car. The car's owner will probably thank you very much.

MODULE 4, NUMBER 15 - AUTO MATH

Worksheet

Concerned about conserving fuel and keeping their cars running properly, many car owners are figuring out the miles per gallon that their cars are averaging between fill-ups. When noticeable decreases occur in the number of miles per gallon a car is averaging, it often indicates that something is wrong with the car. Also, when someone needs to buy a new car, she or he should check to see how many miles per gallon the car is expected to get. The mpg is a good indicator of how expensive it will be to own that car.

The miles per gallon a car averages are easily determined if the driver keeps a record of the mileage driven between fill-ups and the amount of gas used at each fill-up.

$$\text{MILES PER GALLON} = \frac{\text{MILEAGE SINCE LAST FILL-UP}}{\text{GALLONS OF GAS USED THIS FILL-UP}}$$

Example:

Last fill-up		8	9	1	3	4	4
This fill-up		8	9	4	7	6	2

Subtract the last mileage reading on the odometer from the mileage at the time of fill-up:

$$\begin{array}{r} 89476.2 \\ -\ 89134.4 \\ \hline 341.8 \text{ miles} \end{array}$$

If the amount of gas bought at this fill-up was 15.7 gallons, then:

$$\frac{341.8}{15.7} = \text{mpg}$$

Do the division:

```
          2 1.7
15.7 )341.8 0
      314
       27 8
       15 7
       12 1 0
       10 9 9
        1 1 1
```

Round your answer to the nearest mile:

21.7 = 22 miles per gallon (22 mpg)

Try these:

	ODOMETER READINGS							MILES TRAVELED BETWEEN FILL-UPS	GALLONS OF GAS	MPG
		8	9	1	3	4	4			
1.		8	9	4	7	6	2	341.8	15.7	22
2.		8	9	8	5	9	8	383.6	17.2	*22*
3.		9	0	1	3	7	2	*277.4*	12.9	*22*
4.		9	0	5	2	2	4	*385.2*	18.7	*21*
5.		9	0	9	1	1	2	*388.8*	19.9	*20*
6.		9	1	2	7	4	1	*362.9*	19.1	*19*
7.		9	1	5	8	4	3	*310.2*	16.5	*19*
8.		9	1	8	9	4	0	*309.7*	17.3	*18*
9.		9	2	2	5	2	9	*358.9*	15.2	*24*
10.		9	2	5	8	5	8	*332.9*	14.6	*23*

Can you tell when the owner of the above car took his or her car in for a tune-up? *Yes.* When? *Between the times the odometer read 91894.0 and 92252.9.*

What difference in miles per gallon did the car experience after it was tuned up? *It got 6 mpg more after the tune-up.*

How would you figure the mpg if, twice in a row, you did not fill up the car but, instead, put only a few dollars' worth of gas (a few gallons) into the tank?

Combine the mileage from the last fill-up and the mileage at this fill-up to get the miles traveled. Add the gallons used with the partial fill-up to those used at this fill-up to get the number of gallons used. Divide the mileage by the number of gallons used.

Every once in a while, a car's gas gauge will fail to work. Taking a look at the chart under the empty block below, try to figure out the formula for knowing about how far you can travel in your car without running out of gas. Put your formula in the block and try the problems.

CAPACITY OF GAS TANK x *MPG THE CAR AVERAGES* = *MILES YOU CAN TRAVEL ON A FULL TANK OF GAS*

Now, try these:

	ODOMETER READING AT FILL-UP	GAS TANK CAPACITY OF CAR	MPG THE CAR AVERAGES	MILES PER TANK	APPROXIMATE EMPTY TANK ODOMETER READING
1.	1 3 3 6 3 5	20 gallons	17	340	13,703.5
2.	6 2 4 1 1 7	14 gallons	21	*294*	*62,705.7*
3.	3 8 2 2 8 9	18 gallons	26	*468*	*38,696.9*
4.	9 1 0 2 8 6	22 gallons	14	*308*	*91,336.6*

It is possible to estimate what the broken gas gauge would look like if it were working properly. Take a look at the following example.

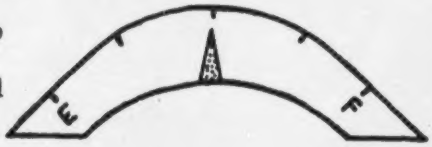
2 3 2 9 5 4 present odometer reading

minus

- 2 3 0 6 2.3 reading at last fill-up

equals

2 3 3.1 miles you have traveled



GAS TANK CAPACITY x MPG = MILES YOU CAN TRAVEL ON A FULL TANK OF GAS

20 x 23 = 460

approximately

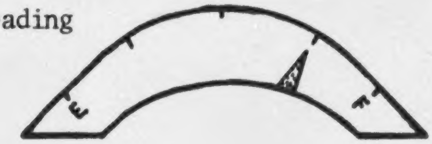
$\frac{233.1}{460} = \frac{1}{2}$ TANK USED

Try the following problems. Draw the indicator needle of the gas gauge to show where it would be (approximately) *if* the gas gauge were working properly.

1.

	2	3	4	3	2	6

present odometer reading



Odometer reading at last fill-up = 23,295.4

Mpg averaged by this car = 24

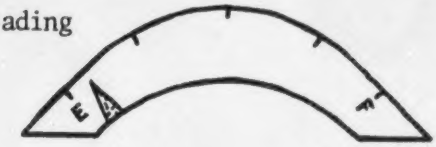
Tank capacity of this car = 20 gallons

$\frac{137.2}{480} = \frac{1}{4}$ TANK USED

2.

	6	2	6	4	4	0

present odometer reading



Odometer reading at last fill-up = 62,151.9

Mpg averaged by this car = 31

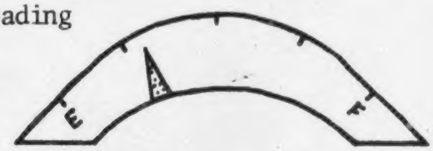
Tank capacity of this car = 18 gallons

$\frac{492.1}{558} = \frac{9}{10}$ TANK USED

3.

	4	8	0	5	2	5

present odometer reading



Odometer reading at last fill-up = 47,850.7

Mpg averaged by this car = 16

Tank capacity of this car = 20 gallons

$\frac{201.8}{320} = \frac{2}{3}$ TANK USED

Now try making up an example of your own. Be realistic!

4.

present odometer reading

Odometer reading at last fill-up =

Mpg averaged by this car =

Tank capacity of this car =

____ = ___ TANK USED